

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF AGRICULTURE.

BULLETIN No. 137.

PROCEEDINGS

OF THE SPRING MEETING

STATE BOARD OF AGRICULTURE,

AND

FARMERS' ANNUAL NORMAL INSTITUTE.

COMPILED BY A. L. MARTIN,
Deputy Secretary and Director of Institutes.



HELD IN

Memorial Hall, West Chester, Penna.,

May 23 to 26, 1905.

1905.

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1905.



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PREFACE.

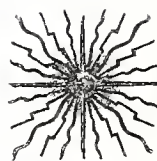
Commonwealth of Pennsylvania,
Department of Agriculture,

Harrisburg, Pa., June 14, 1905.

There is perhaps no source of information upon subjects relating to either practical or scientific agriculture that is so easily available as the Farmers' Institute, and whatever adds to the efficiency of these institutes is of paramount importance. The hope of increasing their usefulness to the farmers of the State, has led to the establishment of what is known as the Farmers' Normal Institute, in which all institute managers and lecturers of the State come together once a year for consultation and instruction.

In order that the instruction given at these institutes may be available to the greatest possible number, this Department publishes in bulletin form their proceedings, and so we send out the following bulletin, No. 137, containing the full proceedings of the Normal Institute held at West Chester, Pa., May 23 to 26, 1905, in the hope that it may prove helpful upon the many farms and in the many farmhouses to which it may come.

N. B. CRITCHFIELD,
Secretary of Agriculture.



LETTER OF TRANSMITTAL.

Commonwealth of Pennsylvania,
Department of Agriculture,
Harrisburg, Pa., June 12, 1905.

Hon. N. B. Critchfield, Secretary of Agriculture :

Dear Sir: I have the honor to present herewith, bulletin of the Sixth Annual "Farmers' Normal Institute" which convened at West Chester, Pa., June 23rd to 26th, 1905.

Very respectfully,

A. L. MARTIN,
Director of Institutes.



MEMBERS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1905.

Members Ex-Officio.

HON. SAMUEL W. PENNYPACKER, Governor.
 MAJ. I. B. BROWN, Secretary of Internal Affairs.
 DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
 DR. G. W. ATHERTON, President of The State College.
 HON. WM. P. SNYDER, Auditor General.
 HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

R. I. Young, Middletown, Dauphin county,Term expires 1905
 Col. R. H. Thomas, Mechanicsburg, Cumberland county,Term expires 1906
 Gen. James A. Beaver, Centre county,Term expires 1907

Appointed by the State Poultry Association.

Norris G. Temple, Pocopson, Pa.,Term expires 1906

Elected by County Agricultural Societies.

	Term expires.
Adams, A. I. Weidner, Arendtsville,	1906
Allegheny, J. S. Burns, Imperial, R. F. D. No. 1,	1906
Armstrong, S. S. Blyholder, Neale,	1908
Beaver, A. L. McKibben, New Sheffield,	1908
Bedford, S. S. Diehl, Bedford,	1906
Berks, H. G. McGowan, Geiger's Mills,	1907
Blair, F. Jaekel, Hollidaysburg,	1907
Bradford, E. E. Chubbuck, Rome, R. F. D. No. 16,	1907
Bucks, W. T. Davis, Ivyland,	1906
Butler, W. H. H. Riddle, Butler,	1906
Cambria, H. J. Krumenacher, Nicktown,	1906
Cameron, W. H. Howard, Emporium,	1906
Carbon,	
Centre, John A. Woodward, Howard,	1906
Chester, M. E. Conard, Westgrove,	1906
Clarion, S. X. McClellan, Knox,	1907

Term expires

Clearfield,	J. W. Nelson,	Shawville,	1907
Clinton,	J. A. Herr,	Mill Hall, R. F. D., ..	1908
Columbia,	H. V. White,	Bloomsburg,	1906
Crawford,	M. W. Oliver,	Conneautville,	1904
Cumberland,	Chas. Mullen,	Mt. Holly Springs,	1906
Dauphin,			1903
Delaware,	J. Milton Lutz,	Llanerch,	1904
Elk,	John M. Witman,	St. Mary's,	1908
Erie,	S. D. West,	Wattsburg,	1907
Fayette,			1903
Forest,	C. A. Randall,	Tionesta,	1904
Franklin,	C. B. Hege,	Marion,	1908
Fulton,	R. M. Kendall,	McConnellsburg,	1907
Greene,	N. M. Biddle,	Carmichaels,	1907
Huntingdon,	Geo. G. Hutchison,	Warrior's Mark,	1906
Indiana,	S. M. McHenry,	Indiana,	1907
Jefferson,	W. L. McCracken,	Brookville,	1907
Juniata,	Matthew Rodgers,	Mexico,	1906
Lackawanna,	Henry W. Northup,	Dalton, R. F. D.,	1906
Lancaster,	W. H. Brosius,	Drumore,	1907
Lawrence,	Sam'l McCreary,	Volant, R. F. D.,	1906
Lebanon,	H. C. Snavely,	Cleona,	1907
Lehigh,	P. S. Fenstermaker,	Allentown,	1907
Luzerne,	J. H. Snyder,	Trucksville,	1907
Lycoming,	A. J. Kahler,	Hughesville,	1906
McKean,	S. B. Colcord,	Port Allegany,	1906
Mercer,	W. C. Black,	Mercer,	1908
Mifflin,	M. M. Naginey,	Milroy,	1907
Monroe,	R. F. Schwarz,	Analomink,	1908
Montgomery,	J. Sexton,	North Wales,	1908
Montour,			1904
Northampton,	W. F. Beck,	Easton, R. F. D.,	1906
Northumberland, ..	J. A. Eschbach,	Milton, R. F. D.,	1908
Perry,	A. T. Holman,	Millerstown,	1907
Philadelphia,	E. Lonsdale,	Girard College, Phila.,	1907
Pike,			
Potter,			
Schuylkill,	W. H. Stout,	Pinegrove,	1906
Snyder,	J. F. Boyer,	Freeburg,	1906
Somerset,	Jacob S. Miller,	Friedens,	1904
Sullivan,	J. K. Bird,	Dushore, R. F. D., ..	1906
Susquehanna,	E. E. Tower,	Hop Bottom,	1907
Tioga,	F. E. Field,	Wellsboro,	1908
Union,	J. Newton Glover,	Vicksburg,	1908
Venango,	August Morck,	Oil City,	1904
Warren,	R. J. Weld,	Sugargrove,	1908
Washington,	D. S. Taylor,	Raccoon,	1908
Wayne,	Warren E. Perham,	Niagara,	1907
Westmoreland,	M. N. Clark,	Claridge,	1907
Wyoming,	D. A. Knuppenburg,	Lake Carey,	1907
York,	G. F. Barnes,	Rossville,	1903

STANDING COMMITTEES.

LEGISLATION.

Hon. A. J. Kahler, Chairman,Hughesville.
 Hon. Jason Sexton,North Wales.
 N. G. Temple,Pocopson.
 H. G. McGowan,Geiger's Mills.
 M. N. Clark,Claridge.

CEREALS AND CEREAL CROPS.

J. A. Eschbach, Chairman,Milton.

ROADS AND ROAD LAWS.

P. S. Fenstemaker, Chairman,Allentown.

FRUIT AND FRUIT CULTURE.

John F. Boyer, Chairman,Mt. Pleasant Mills.

DAIRY AND DAIRY PRODUCTS.

R. J. Weld, Chairman,Sugargrove.

FERTILIZERS.

Howard G. McGowan, Chairman,Geiger's Mills.

WOOL AND TEXTILE FIBRES.

D. S. Taylor, Chairman,Raccoon.

LIVE STOCK.

D. A. Knuppenburg, Chairman,Lake Carey.

POULTRY.

Norris G. Temple, Chairman,Pocopson.

FORESTS AND FORESTRY.

Irvin C. Williams, Chairman,Harrisburg.

APIARY.

J. W. Nelson, Chairman,Shawville.

FLORICULTURE.

Edwin Lonsdale, Chairman,Girard College, Phila.

PROCEEDINGS OF THE PENNSYLVANIA STATE BOARD OF
AGRICULTURE, AT A MEETING HELD IN MEMORIAL HALL
WEST CHESTER, PA., TUESDAY, MAY 23, 1905.

ORDER OF BUSINESS.

Call to order at 2.00 P. M.

1. Roll-call of Members.
 2. Reading of Minutes.
 3. Appointment of Committee on Credentials.
 4. Reception of Credentials of Members-elect and Delegates.
 5. Report of Committee on Credentials.
 6. Unfinished Business.
 7. New Business.
 8. Miscellaneous Business.
 9. Adjournment.
-

Memorial Hall, West Chester, Pa.,

Tuesday, 2 P. M., May 23, 1905.

Vice President, Geo. G. Hutchison, in the Chair:

THE CHAIRMAN: The Board will please come to order. I am sorry that the Governor is not here to fill this place; he may be later. We will take up the order of business as you find it printed in the program furnished you. On page seven is the program for the Board meeting. The first thing in order will be the roll-call of the members by the Secretary.

Secretary Critchfield proceeded with the roll-call and the following members of the Board were present:

A. I. Weidner, J. S. Burns, S. S. Blyholder, S. S. Diehl, H. G. McGowan, F. Jaekel, E. E. Chubbuck, W. T. Davis, W. H. H. Riddle, W. H. Howard, M. E. Conard, S. X. McClellan, J. W. Nelson, J. A. Herr, H. V. White, M. W. Oliver, Chas. Mullen, John M. Witman, S. D. West, C. B. Hege, R. M. Kendall, N. M. Biddle, Geo. G. Hutchi-

son, S. M. McHenry, Matthew Rodgers, Henry W. Northup, W. H. Brosius, Sam'l McCreary, H. C. Snavely, P. S. Fenstermaker, J. H. Snyder, A. J. Kahler, S. B. Colcord, W. C. Black, M. M. Naginey, R. F. Schwarz, W. F. Beck, J. A. Eschbach, A. T. Holman, W. H. Stout, J. F. Boyer, Jacob S. Miller, J. K. Bird, E. E. Tower, J. Newton Glover, August Morek, R. J. Weld, D. S. Taylor, Warren E. Perham, M. N. Clark, D. A. Knuppenburg and G. F. Barnes.

Of the Consulting Specialists, the following were present:

Dr. J. H. Funk, pomologist; Dr. Leonard Pearson, veterinarian; Prof. Franklin Menges, entomologist; Prof. H. A. Surface, ornithologist; Col. H. C. Demming and W. H. Stout, geologists; and Prof. Geo. C. Butz, apiarist.

The CHAIRMAN: The next thing in order will be the reading of the minutes of the last meeting.

Secretary Critchfield then read the minutes of the last meeting.

The CHAIRMAN: You have heard the reading of the minutes. Are there any corrections?

A motion was made that the minutes be approved as read.

SECRETARY CRITCHFIELD: Mr. Chairman and Members of the Board of Agriculture: Before the approval of the minutes, perhaps it will be well for me to state that the Executive Committee had a meeting just before we went into session, and this meeting was called for the reason, that after some correspondence of the Secretary with Dr. Wadsworth, who was elected by the Executive Committee or appointed as one of the geologists of the Board, it was thought best to excuse Dr. Wadsworth and appoint in his place, Col. H. C. Demming, who has been the geologist of the Board for years past. Dr. Wadsworth had written to the Board and asked to be excused, and gave as his reasons that his work had been increased so much that it would be practically impossible for him to attend the meeting of the Board and to make a regular report. I am not able to say whether I mentioned that matter to the Executive Committee or not; it is quite possible that I did not. So I wrote to him to ascertain whether it was his desire to continue or still his desire to be relieved, and his answer confirmed what he had said in the former letter, that he was very busy at State College. If, however, the Board thought best, he was willing to do the best he could and so he left it with the Committee and the Board, and the Executive Committee has taken action and asked me to report as I have now done. I think it might be well for this amendment to the Executive Committee's report to be acted upon by the Board before the approval of the minutes.

Upon the request of the Chair, the previous motion was withdrawn and followed by a motion to approve the report of the Executive Committee as stated by the Secretary, which motion was agreed to; whereupon the motion to approve the minutes of the last meeting, as read by the Secretary, was renewed and agreed to.

The CHAIR: The next thing in order is the appointment of a committee on credentials. The Chair appoints as such committee: Joel A. Herr of Clinton county, J. W. Nelson of Clearfield county, S. M. McHenry of Indiana county, W. H. H. Riddle of Butler county, D. A. Knuppenburg of Wyoming county, W. H. Howard of Cameron county and G. F. Barnes of York county.

Any one having credentials from local societies or horticultural societies will please hand them to Mr. Herr, the Chairman of this Committee.

On motion of Mr. McClellan, duly seconded, it was agreed to pass over Section 5 on the program.

Mr. Temple made an announcement at this time in reference to the Normal School extending an invitation to the members to visit the school any afternoon this week after four o'clock, also an invitation to visit the Separator works.

The CHAIR: You have heard these announcements. Dr. Phillips stated to me this morning that he should be very much pleased to have any one here visit the Institution. They have an elegant Institution, with beautiful surroundings and they are doing good work.

The CHAIR: Unfinished Business is next in order.

None was presented.

The CHAIR: The next is New Business. The newest I know of is that I believe the Governor has signed the bill allowing \$3,500, is it not, to pay the expenses of the Board. The Board members have been paying their own expenses at annual meetings.

The SECRETARY: It was approved on the 11th day of May 1905. The amount is \$3,500. Mr. Chairman, in regard to that matter I want to say that I had a talk with the Chairman of the House Committee on Appropriations before drafting the bill, and he said to me: "I hope you will make the amount just as low as possible in order to meet the expenses which you wish to meet," and I made as careful a calculation as I could and I thought that \$3,500 would be sufficient. If we find that it is not enough, we will have a chance hereafter to ask that it be increased. The important thing was to get the thing started. A like bill had been turned down on

several occasions, and the Appropriation Committee do not like, as a general thing, to take up a thing that has been turned down, and the Governor, as a general thing, don't like to sign a bill that has been disapproved by his predecessor.

MR. BLYHOLDER: Mr. Chairman, I move you that this Board extend their thanks to the members of the Legislature, and the Governor for giving us this legislation.

MR. STOUT: I move to amend, by adding all others who aided in getting the appropriation passed.

The amendment was accepted and the motion, as amended, agreed to.

The CHAIR: It is so ordered and the Secretary will communicate this to those interested.

Dr. Armsby of State College was called for by the Chairman.

DR. ARMSBY: Mr. Chairman, I did not expect to be called upon to say anything at this time, but I can say very briefly that the Legislature, while it did not entirely meet the wishes of the friends of agriculture, did make, on the whole, a very liberal appropriation for the promotion of agriculture at the State College. It approved the request for \$150,000 for the construction and equipment of the agricultural building for which \$100,000 was appropriated in 1903. In the same connection the bill carried an appropriation of \$24,000 for the extension of the steam and electric plants and for piping, the construction of a tunnel and for providing light and heat and power for the same.

In addition to this, there was an appropriation of \$30,000 for two years for the maintenance of agricultural courses and \$10,000 for two years for the maintenance of an agricultural experiment station, besides a small item of \$2,500 for the erection of an implement shed and poultry plant on the experiment station farm. The bill in this form went to the Governor, and as a good many of you know, he approved the items for maintenance, but found it necessary, on account of the limitation of the State's revenue, to disapprove part of the items, reducing it from \$150,000 to \$75,000 and disapproving entirely the item for the tunnel and other matters providing for the heating and lighting plant, so that the total of the appropriations approved by the Governor is about \$114,000. I am trusting somewhat in making these statements on the report of the Legislative Committee of the allied agricultural organizations which are about to meet, immediately following this. Having been called upon to make this statement, it seemed best that I should, to this extent at least, anticipate their report.

What action it will be found best to take, I am not in a position to say; the matter so far has not been determined. The College will not relax in any way its efforts for the advancement of agriculture, and it will not rest satisfied until they see that agricultural building completed according to the plans which were virtually authorized two years ago.

We shall simply go ahead with the work in the completion of the agricultural building, and with the funds we have shall probably be able to complete about half of it, and we shall simply use that half as best we can, making no reduction in the size or quality of the building, simply going as far as we can and stopping, depending upon the legislature, through the influence of the farmers in the State, to provide the means for completing it and fully equipping it two years from now. In the meantime we have a somewhat increased maintenance fund which we hope to be able to use for the advantage and benefit of the agricultural interests of the State. It is too early yet to say just what we shall do with it, but it will certainly have a very careful consideration by the Board of Trustees and those most interested in carrying out the policies of the College, and we shall try to serve you to the best of our ability with the funds thus placed in our hands.

DEPUTY SECRETARY MARTIN: Mr. Chairman, and Members of the Board: We are pleased to announce that through the generosity of Mr. Kates, the owner of a farm over which our good friend Mr. Detrich is placed in charge, we are invited to visit their farm to-morrow at twelve o'clock. Conveyances will meet us here at the Hall by arrangement to carry all the delegates and members out to this farm, where a lunch will be prepared for us, and in the barn, if the weather should be unfavorable outside, we will hold the afternoon session of our normal meeting.

This is a very generous offer and affords a fine opportunity for the members and delegates not only to visit this farm, but to view the beauties of old Chester county in that portion of it.

I feel quite certain that every visitor will be pleased to have this opportunity to see something of the remodelling and revising of what we are sometimes pleased to call a farm that has hitherto been neglected, and to see something of the contrast as between this neglected place and the methods of modern cultivation and improvement. It is our opportunity. As we go to this farm, let it be with the object in view to learn something for ourselves, and to gather suggestions from the very worthy ownership and management of this farm. I cast my eye about but fail to see Mr. Kates in the audience, but I see Mr. Detrich here.

I hope that every member will get acquainted with Mr. Kates, and

I had hoped that he would be present and favor us with some remarks at this time. We would like, however, to hear from Mr. Detrich as his representative.

MR. DETRICH: Mr. Chairman and Members of the State Board of Agriculture: I will say on behalf of Mr. Kates, that he is very glad to have the opportunity of inviting you to visit his farm. He took the farm under most adverse circumstances and the conditions were such as to present great difficulties that we are beginning to overcome. We are very much pleased with the progress already made and would like to have you come and see for yourselves what is being done in accordance with the methods carried on for many years at Flourtown. We shall be able to show you some fields that have never been touched and some on which we are applying the methods that were so successfully used at Flourtown. You can see the contrast for yourselves between the fields that have been redeemed and taken care of, and the fields lying just as they were one year ago. We are very anxious for every person in this audience to see the proprietor as well as myself, and we want to meet you all at "Harvest Home Farm" to-morrow afternoon.

The Committee on Credentials announced through its Chairman that it was ready to report.

REPORT OF THE COMMITTEE ON CREDENTIALS.

The Committee on Credentials Respectfully Report that we Examined the Credentials of the Following Persons for Membership in the State Board and Found them Correct:

W. C. Black, Mercer county, term expires, 1908.

R. F. Schwarz, Analomink, Monroe county, term expires 1908.

J. Newton Glover, Vicksburg, Union county, term expires 1908.

(Signed.)

J. A. HERR,

D. A. KNUPPENBURG,

W. H. H. RIDDLE,

G. F. BARNES,

W. H. HOWARD,

J. W. NELSON,

S. M. McHENRY.

Committee.

On motion, the report of the Committee on Credentials was adopted as read.

MR. HERR: Mr. Chairman, I am advised that J. A. Eschbach, of

Northumberland county has credentials but has only recently received them, and they not being before the Committee, we could not act on them. I would move that Mr. Eschbach be allowed a seat with us, and to act with us during this meeting.

Motion seconded by Secretary Critchfield.

The CHAIR: Would it not be well to amend that to this extent, providing his credentials are in due form.

The motion of Mr. Herr was agreed to.

SECRETARY CRITCHFIELD: Mr. Chairman and Members of the Board: It will be remembered that the Secretary was requested at our last meeting to appoint committees on fruit and vegetables. This of course is an unseasonable time for the exhibition of fruit, yet we do not know but what some member of the Board may have brought some fruit here that was kept in cold storage, and I do not know of anything more pleasant to look upon. I wish to announce that I have appointed, with the consent of the parties, Messrs. J. H. Funk of Berks county, J. H. Ledy of Franklin county, two of the leading fruit growers of our State, and the Chairman, Mr. Hutchison, and Mr. Stout of Schuylkill county, and Mr. Miller of Somerset county, to act as a committee on vegetables.

I want to say further, that Mr. Temple assures me that ample arrangements have been made for receiving and displaying any fruit or vegetables that may be brought in during our session so that if any of you have samples to bring, you can bring them in.

The CHAIR: I see in the audience some Chester county people, among them my good friend, Mr. Downing, who has been associated with us for many years. I hope he will have a word to say to us.

MR. DOWNING: Mr. Chairman, I am very much gratified to meet the members of the State Board again and especially so in my home—near to my home. There are some yet remaining in the Board that I remember with a good deal of affection, although the members are now mostly strangers to me. At the same time I will say that it is with great pleasure that I welcome you all to Chester county. Chester county people are like other people. I find when I travel that the people all over the country are good people on the average. It is so all over the country. I find among the young people in street cars both courtesy and kindness. If you go into a bank or into the homes of the people in the United States and get a little in touch with them, they will be interested in you at once. We are just like all our people, good-hearted and all that.

I hope really you will enjoy yourselves while you are here and I hope that I may have the pleasure of meeting you all again.

The CHAIR: I see here our friend, Mr. John I. Carter, a Chester county farmer. I will be glad to hear from him.

MR. CARTER: Mr. Chairman, and Members of the State Board of Agriculture: I won't undertake to make a speech at all. Like our friend, Mr. Downing, I am very glad to meet you here and to see some members of the old Board again. Some of the most pleasant times that I can recall are when the State Board of Agriculture met, with Governor Robert E. Pattison as Chairman of the Board. Those days were pleasant days and I think profitable, and have left good seed in the land that is going to bring forth fruit. I am glad to meet you all.

The CHAIR: I see my friend, Mr. Fox, from over in Chester Valley present. I know that we would all like to hear from him.

MR. FOX: Mr. Chairman, it is a well known fact that I am not a public speaker, but I assure you that we plain farmers of Chester county are pleased that you have come to the city of West Chester to hold your annual meeting. When it was announced to us some time ago that you would meet with us, we thought then, or we understood it would be in the Fall, and we had been making an effort to bring together the farmers to try to show you what we can produce in the way of agricultural products. That led to an organization which we trust will not only be a pleasure but a practical benefit to the farmers of this community. We have organized an agricultural society brought about by your decision to come here and meet with us.

One of your members thought that you would meet here in October or some time in the Fall. We then, as I have said before, began to work together for the purpose of organizing a county fair, and that led to the organization of a permanent association. We hope that many of you will be with us in the Fall to witness our own exhibit in that line.

I am glad to learn that one of our farmers invited this body to visit the farm across the valley and see how they manage things out there. You will see many farms that are productive in this valley, not exactly along the line of our neighborhood in this valley, but carefully, economically and scientifically carried on.

This is a dairy county, one of the best dairy counties I think in Eastern Pennsylvania, in fact, I do not know its equal anywhere. It is well adapted to that industry. We are not depending on clover entirely for that purpose, to produce grass. Our highlands along the Brandywine Creek grow excellent grass; it is surprising that they produce as much as they do and it is due to the natural fertility of the soil.

We trust that your meeting here will do us much good and that we will derive great benefit from your coming. I was not aware that this was to be a meeting of this character this afternoon, but I think that your meetings later will develop papers that will be very useful and instructive to us.

The CHAIR: We have a gentleman here from way out near the Ohio line that we are always delighted to have with us—Brother Orr. We would like to hear from him now.

MR. ORR: Mr. Chairman and Members of the State Board of Agriculture, and Ladies and Gentlemen: Our friend on the left here, said to me, "Now you can get up and crow." That reminds me of a little experience over in New Jersey some two or three years ago, where an Ohio man was called upon and he was a dairyman, and I a chicken man. There was a bee man there also, and he and I had an argument on which was the more useful animal, the cow or the hen, and since then, whenever they get a shot at me, they are always throwing it at me, "Now, old rooster, it is your time to get up and crow," or, "Old hen, it is your time to rise up and cackle." My time to crow and cackle is later on, upon this program. I am very much surprised that the Chairman should call on me now to say anything this afternoon. I came utterly unprepared and without thought.

My first experience in Pennsylvania was nineteen years ago this summer, when I first came into the State and the very first place I went to was to Chester county and I stopped at one of the hotels at West Chester, and from this place, as a central point, I traveled out over this great county of Chester studying its agricultural and livestock interests and particularly its dairy interests. The things I saw and learned then in Chester county impressed me so much and so favorably that I have always regarded Chester county as the county which stood ahead of all others in Pennsylvania as an agricultural, live stock and dairy county.

It was my pleasure to have as guides, two well informed gentlemen who showed me what I saw in Chester county. They took a great deal of pride and pleasure in pointing out to me the points of historical interests of which this county is so full. Notwithstanding the years that have passed, that first impression still remains with me, and I have always regarded Chester county as a good school to which a young man might come.

As I have crossed Chester county since and seen the changes taking place in dairying lines particularly, I have been much impressed. We do change; the world does improve, for nineteen years

ago the dairy methods were entirely different from what they are now. Now you have in this city one of the largest, if not the largest, manufacturing institutions in the world, sending out separators wherever dairying is carried on. There has been a wonderful advance along all those lines, and it is with a great deal of pleasure that I am permitted to be here to-day, and I look forward with a great deal of interest to the privileges which we shall enjoy at this meeting.

MR. MARTIN: This Board is always glad to renew the acquaintance of Brother Orr and I know they will be doubly glad when they learn that his worthy wife is present with us. Mrs. Orr has come along this time to kind of take care of him, and we would highly appreciate a word from Mrs. Orr.

The CHAIR: We shall be glad to hear from the lady, Mrs. Orr, of Beaver.

MRS. ORR: Mr. Chairman, Ladies and Gentlemen, This is certainly a great surprise to me, but it is also a great pleasure to feel that I have been so honored as to be called upon to say even one word to this agricultural board, and I thank you. I feel very much like a child again and can hardly realize it at all. I am here to learn from you, but if I can at this time or any other time say or do anything that will in any way promote any true line of the work in which you are engaged, I am at your service.

I was so delighted to see these—our fathers shall I say—sitting near me here, rise and speak to us and tell us their experiences. How delightful are the recollections they have in these days when they feel that in a certain way they are laying down active service; and yet when they rise and speak to us so beautifully and so well such words as they have to-day, are they not now doing their greatest service? And I want to say just here, to speak what I truly believe, that we so often in life in the hurry and the bustle and the noise that we make, lose sight of the fact that perhaps, after all, when our more active life ceases, we may be speaking and doing and exhibiting our very greatest work when we step out of active service. I have been brought to think of that line particularly recently by the death of a man in our own community whom we all respected very highly, and yet whose services so frequently were not appreciated. Suddenly he was taken away from us and now we feel that his work is but begun, so our fathers who sit with us perhaps are now doing us their greatest service, while the work that we think we are doing here so well, is perhaps but begun.

The CHAIR: Is there any other one here who wishes to say a word? If so, we shall be glad to hear from you. You all can talk

on some subject; let us spend a little while in that way, if it is your pleasure.

MR. BLYHOLDER: Call on some more.

The CHAIR: Well, I will call on Brother Blyholder, then.

MR. BLYHOLDER: It does not seem to me that we gentlemen should go away this afternoon without spending some time, if not in the actual work, as we might say, of the Board, discussing results and things of that kind, yet in a social way, it seems to me, we can do a great deal that may be beneficial.

I want to say to you frankly that this is my first visit to West Chester, and I called on a gentleman to-day whom I have met before in agricultural meetings, not of this body, but in other meetings for a number of years. He is now ninety years of age and he is not able to go out of his house, whose hands I shook this afternoon and whose grasp I will not soon forget. I would feel fully repaid for coming here by that warm hand-grasp if there were nothing else and it seems to me that we may well pay more attention, and profitably devote more time to the social features of farm life, for when this has been lost, a great deal has been lost.

I am glad that it is my good fortune to be present with you here to-day and to look in the face of Brother Downing, and other friends whom we have the pleasure of meeting here, who are engaged in the same work with us along agricultural lines. I came into the Board some years ago when I was considerably younger than I am to-day and Brother Downing was then an active member, as well as others I might mention. My relations with the Board have always been very pleasant and they have done a great deal for me along agricultural lines as well as a great deal for me in social lines.

I feel that we are engaged in a great work in agriculture, and I believe that this is going to be a great meeting here. I am sure that Brother Martin has prepared for us a strong program from which we shall all derive a great deal of valuable instruction, which will be of great benefit to us in carrying on the work along all the lines in which we are interested and in these Farmers' Institutes that are doing so much and have done so much in the promotion of the interests of the farmers of this great Commonwealth. It is a pleasure to me to come to Chester county, and there is only one thing that I have seen that I do not like to see and that is, the many weeds that I have noticed in passing over some portion of the county, so many weeds growing along in some places that I could hardly realize I was in Chester county. If we can find some method that will lead to the destruction of these weeds while we are down here attending this meeting, it will certainly be a grand good thing for Chester county.

Now I think I have occupied more time than I should and I will give way to my friend Robert Seeds and he will come forward and tell us all he knows about farming.

The CHAIR: We shall be glad to hear from Mr. Seeds, and he will please come forward.

MR. SEEDS: Mr. Chairman, I do not think it is altogether fair to bring a man out here into this meeting just on the spur of the moment, just the moment he comes into the hall. I don't know anything about the program, or anything that has been done here this afternoon. I am pleased to meet with you; I am always pleased to meet with the farmers, and with all the people interested in agriculture. Since I live on a farm and since I am interested in agriculture, I want to meet with the people who are interested along the same lines, because as "iron sharpeneth iron," so we will be benefited by meeting with the people interested in the same calling. If I was to move off my farm to-morrow and go to the State of Illinois, and engage in some other line of work, I would turn my back on the people engaged in agriculture and go and meet with the men engaged in my line of work. If we sat on a locomotive, I would meet with the men who run locomotives. But I am here to-day because I am interested and you are all interested in the promotion of the interests of agriculture, because I believe I shall be benefited by the association, and that my calling will be benefited.

I believe in looking ahead and never looking behind. If I have got to pay a note that I have endorsed for a man, after I pay it I never think about it. I am always looking into the future and always keeping my eyes towards the sun, because then I know that the shadow will fall behind me. Ever since the time when the world was brought into existence men have been thinking about new things, and reaching out after new and improved methods. They have been saying that this won't do, and that won't do at all; we must have something better, and so the world continues to move on. It has been so from the time that Adam went into the Garden of Eden up to the present time, and the mighty steamship that now crosses the ocean has been a development from the little boat originally constructed by Robert Fulton. When Fulton was building that steamboat, he had a rich uncle who had money to burn, and the uncle told him it wouldn't do, but Robert Fulton worked on; he never ceased his efforts and after his little steamboat was completed and he pushed it out into the Hudson River, and rang the bell to go ahead, there was trouble in in that steamboat and it wouldn't move, and his uncle stood on the bank and said, "I told you it wouldn't go; it will never go." But Robert was not discouraged. He took his wrenches and his tools, and he did this and he did that, he adjusted this bolt and that screw,

he did a few things that he thought necessary, and then he pulled the throttle open, and his little steamboat moved on, and his old uncle stood on the bank and shouted after him and said, "You'll never get it stopped, you'll never get it stopped!" This is the way things have been going ever since the foundation of the world. I am spending money to-day and paying expressage, trying this thing and that in the endeavor to improve and to progress, and gentlemen, as long as I am interested in agriculture, I am going to meet with you people, because I believe that it is our duty to continue to move on, to forge ahead, and if a man lives to be as old as Methusaleh, he shall still keep at it, and not be satisfied with the progress made by his ancestors, but keep right on moving and forging ahead. Nothing is so successful as success, and the great thing is to hit the mark and to hit it hard, and you have got to strike while the iron is hot.

Speaking of hitting the mark brings to my mind the story of an old lady going to an experience meeting, and she got up to give her experience and to tell what she was thankful for. Now this seems to be something like a Methodist experience meeting with Brother Hutchison presiding. This old lady got up and said that she was thankful for one thing, and that was that she had one tooth left above and one tooth left below and they hit and I tell you I have learned something which will follow me all the days of my life, and that is, that unless you hit the mark, there is no success. I wouldn't read a poem if I had to go over two or three pages in order to get one point. I can't afford to spend that much time simply to get one point. He has got to hit the mark as soon as he takes up his pen, and that is the reason I like to read after James Whitcomb Riley, the Robert Burns of America; he hits the mark.

I thank you for the privilege of saying these few words, Brother Hutchison. I know we will all go home and be benefited through what we learn here for the work that is to be done in the future. I want to say to you as Institute workers, we men on the platform—that the men down in the audience are getting up pretty close to us; don't forget that. I notice that every day in my life. I noticed it right over here north of Philadelphia when the farmers got after Prof. McDowell and plied him with questions as to the difference between rock and bone, and some man asked me a question before I got started, and I stood there for three-quarters of an hour and never said a word of my speech, trying to answer the questions. This shows that the men in the audience are thinking about things and are hitting us close and hard.

I thank you, gentlemen, for this privilege and I am glad to meet you all and after awhile I will give you all the privilege of meeting me at the door and shaking me by the hand.

The CHAIR: I see Dr. Rothrock present, and I know we would all be glad to hear from him. Will the doctor please come forward?

DR. ROTHROCK: Mr. Chairman, I did not expect to say anything this afternoon. I thought you would hear me to-night, and I would wear out my welcome then. I am glad to see so many of you here as there are. I had hoped that we might have this hall full to-day and am sorry that I cannot be with you more, but I have a number of extensive operations going on in another part of the State and had simply come home for the purpose of packing up to get off, and thought I would take the time to call and see you here. We are glad to see you in Chester county. We believe we have got here in Chester county one of God's own spots. I have traveled over a good deal of North America and am always glad to get back to Chester county, not simply because it is my home, but because I find that wherever I go there is no place that appeals to me so much as this county does. We have got a magnificent section of the State here. We haven't got the great coal mines of the central part of the State. There are a great many things that other regions have that we do not have, but we have a splendid section, and we have an honest, intelligent community here who will welcome you I am sure with open hands and open hearts. Whatever makes for the interest of agriculture, we believe makes for the interest of this great country. It is true that my work has not been very largely in agriculture, as agriculture is understood usually, yet I believe that the work which I have in hand and in my humble way have been trying to do, is one that will help agriculture in the end.

Take for example the work we have been doing in the Cumberland Valley. A short time ago a certain official said to me: "You have paid too much money for the land you have purchased in the Cumberland Valley, \$3.50 an acre. You could have gone into my county and have bought three times that amount of land for the same money;" all of which was true, but what good would that land there have done for the Cumberland Valley? We purchased 50,000 acres of land there and we purchased it for the State as long as time endures, and so long will the benefits inure to that county as the result of that purchase, and I believe the prosperity of the whole Cumberland Valley depends upon the forestry conditions which will be promoted by this purchase. Governor Stone made a remark some time ago that was eminently wise. It was this: "If the forest reservation is a good thing in Cumberland county, why is not a forest reservation a good thing for every part of the State?" Now Governor Stone was right. I hope to see the time come when every county of this Commonwealth will have the water nurtured, for water is a necessity for the sustenance of your crops and your flocks, and I

hope that every county in the State of Pennsylvania will have a forest reservation.

In 1880 I visited Germany and when I was there, for the first time in my life I saw what the people were doing on waste land. Now what does it mean to Germany? The forest reservations of Germany? Why it means that the revenue that the German Empire receives from its state forest reservations is so great that if you were to blot out that revenue from the German treasury, you would reduce the German Empire to a second-rate power on the map of Europe. We are only beginning to see the importance of this, when our great corporations are stealing upon the water-courses of the State for the purpose of turning their wheels or driving their machinery. The headwaters of the State are essential to the health and prosperity of the Commonwealth. It is a very important thing that we should control the headwaters of all these streams so that our towns may have pure water; that the water which comes from your springs may be pure. A very large portion of those who die every year in our community die simply because of the filth and disease germs that are carried into their systems from the water. It is, therefore, important, very important, that the State should own these headwaters of the streams. Now these are just a few facts that I have had brought before me in the course of my duties as a public officer.

I want here to mention a little circumstance which may impress you as in the nature of a useful lesson. A number of the farmers believed in this great movement and were interested in it in 1893, and I had the honor for the first time then of appearing before the farmers of the State, and I read a paper there, and was fortunate enough to secure the approval of the State Board, or the State Board of Agriculture, as it then was. The gentleman who presided at that meeting, was one who had bitterly opposed the movement—I might almost say ignorantly opposed it, and when the unanimous vote was given, which asked the Governor of the Commonwealth to do what lay in his power to forward this movement, that gentleman saw then and there that he was opposing the sentiment of his agricultural brethren, and he could not get around quick enough the next day when he appeared in the House of Representatives. When he came into the House, he appeared on the other side of the question. That was all due to the influence of the farmers of this State.

MR. STOUT: Is it in order to offer a resolution at this time?

The **CHAIR:** Let us hear it.

MR. STOUT: Whereas, The Legislative Committee of this Board did not succeed in their efforts to obtain the consent of the Legis-

lature granting the privileges to trolley railroads to carry freight, therefore, be it

Resolved, That, in the opinion of the members of this Board, the demand for the enactment of the proposed law should be again presented to the next session of the Legislature by the Legislative Committee.

The adoption of the resolution having been moved and seconded, it was agreed to.

DEPUTY SECRETARY MARTIN: I want to state that this evening's session will be presided over by Dr. M. E. Conard and there will be an address of welcome by Burgess Charles H. Pennypacker, and if the Governor is present, he will respond to that address. There will also be an address by Dr. J. T. Rothrock and by Dr. J. H. Funk.

MR. HERR: Mr. Chairman, the talking this afternoon has been along lines which interested me very much. In looking around it makes me feel older than I ever felt before to find so few members of the Board of Agriculture who have been working with me for many years on this Board; but it affords me a great deal of pleasure when I turn around and meet my Brother Downing here. He was an effective and efficient working member of the Board, contributing so much to the literature of the Board and whose history will be found recorded in its minutes and in its annual reports. I have also had the pleasure of meeting quite a number of others who have been with us quite a long time on the Board. I was glad to hear from Dr. Rothrock and the citizens of Chester county; and I want to say that the State will never be able to repay the services of some of the citizens of this county, and especially of the services of Dr. Rothrock and Brother Downing and Brother Carter. These are three men whom the State will never be able to pay for the actual services they have rendered in the work of your Board and in the work of the Department of Agriculture.

I am very glad indeed that we have to-day the pleasure of meeting in their county, and I am pleased that the Governor has seen fit to recognize the Board in approving the act of the Legislature providing money to pay its expenses. I hope the Board will be filled up, and those who are here will not only be as efficient, but will be as earnest and as sincere as the members of the Board have been for the last twenty-five years.

On motion, the Board adjourned.

N. B. CRITCHFIELD,
Secretary.

DIVISION OF FARMERS' INSTITUTES.

LIST OF COUNTY INSTITUTE MANAGERS FOR SEASON OF 1904-5.

County.	Name and Address of Chairman.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Beaver,	A. L. McKibben, New Sheffield.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cambria,	H. J. Krumenacker, Carrolltown, R. F. D.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Centre,	John A. Woodward, Howard.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Mill Hall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Elk,	John B. Werner, St. Marys.
Erie,	Archie Billings, Edinboro.
Fayette,	J. M. Hantz, Merrittstown.
Forest,	C. A. Randall, Tionesta.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. Ewing Bailey, Carmichaels.
Huntingdon,	Geo. G. Hutchison, Warriors' Mark.
Indiana,	S. M. McHenry, Indiana.
Jefferson,	W. L. McCracken, Brookville.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton, R. F. D.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Volant, R. F. D.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstemaker, Allentown.

County.	Name and Address of Chairman.
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Luzerne,	J. E. Hildebrandt, Dallas R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
McKean,	L. W. Howden, Coryville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Monroe,	Randall Bisbing, East Stroudsburg.
Montgomery,	Jason Sexton, North Wales.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D.
Northumberland,	J. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	Edwin Lonsdale, Girard College, Phila.
Pike,	J. H. Van Etten, Milford.
Potter,	Horace H. Hall, Ellisburg.
Schuylkill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	George A. Woodside, Sugargrove.
Washington,	D. M. Pry, Burgettstown.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey
York,	B. F. Koller, Shrewsbury.

LIST OF INSTITUTE LECTURERS FOR SEASON OF 1904-5.

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
 Bashore, Dr. Harvey B., West Fairview, Cumberland county.
 Beardslee, R. L., Warrenham, Bradford county.
 Black, W. C., Mercer, Mercer county.
 Bond, M. S., Danville, Montour county.
 Brodhead, C. W., Montrose, Susquehanna county.
 Brubaker, A. L., Hogestown, Cumberland county.
 Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
 Butz, Prof. George C., State College, Centre county.
 Campbell, J. T., Hartstown, Crawford county.
 Clark, M. N., Claridge, Westmoreland county.
 Conard, Dr. M. E., Westgrove, Chester county.
 Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
 Cox, John W., New Wilmington, Lawrence county.
 Cure, Z. T., Jermyn, Lackawanna county.
 Detrich, J. D., West Chester, Chester county, R. F. D. No. 12.
 Drake, W. M. C., Volant, Lawrence county.
 Foight, John G., Export, Westmoreland county.
 Funk, Dr. J. H., Boyertown, Berks county.
 Hall, Horace H., Ellisburg, Potter county.
 Hantz, Prof. J. M., Merrittstown, Fayette county.
 Harlan, Hon. A. D., Wenonah, N. J.
 Harshberger, J. W., Ph. D., Philadelphia.
 Herr, Joel A., Mill Hall, R. F. D., Clinton county.
 Hill, W. F., Chambersburg, Franklin county.
 Hoover, Hon. E. S., Lancaster, Lancaster county.
 Hull, Geo. E., Transfer, R. F. D., Mercer county.
 Johnston, J. B., New Wilmington, Lawrence county.
 Kahler, Hon. A. J., Hughesville, Lycoming county.
 Ledy, J. H., Marion, Franklin county.
 Lehman, Amos B., Fayetteville, Franklin county.
 Lighty, L. W., East Berlin, Adams county.
 McDonald, John T., Delhi, N. Y.
 McDowell, Prof. M. S., State College, Centre county.
 Menges, Prof. Franklin, York, York county.
 Northrop, C. D., Geneva, N. Y.
 Northup, Henry W., Dalton, R. F. D., Lackawanna county.
 Orr, T. E., Beaver, Beaver county.
 Owens, Prof. Wm. G., Lewisburg, Union county.
 Patton, James Y., New Castle, Lawrence county.
 Peachey, J. H., Belleville, Mifflin county.
 Philips, Hon. Thomas J., Atglen, Chester county.
 Riddle, W. H. H., Buttler, Butler county.
 Schock, O. D., Hamburg, Berks county.
 Schwarz, Hon. R. F., Analomink, Monroe county.
 Seeds, R. S., Birmingham, Huntingdon county.

Stout, W. H., Pinegrove, Schuylkill county.
 Stuart, R. R., Callensburg, Clarion county.
 Surface, Prof. H. A., Economic Zoologist, Harrisburg.
 Thayer, Dr. I. A., New Castle, Lawrence county.
 Wagner, F. J., Harrison City, Westmoreland county.
 Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.
 Watts, Prof. R. L., Scalp Level, Cambria county.
 Watts, D. H., Kerrmoor, Clearfield county.
 Waychoff, G. B., Jefferson, Greene county.

STATE OFFICERS.

LIST OF OFFICIALS REPRESENTING THE DEPARTMENT OF AGRICULTURE, WHO ENGAGE IN INSTITUTE WORK WHEN TIME FROM OFFICIAL DUTIES WILL PERMIT.

HON. N. B. CRITCHFIELD, Secretary of Agriculture.
 HON. A. L. MARTIN, Deputy Secretary and Director of Institutes.
 DR. B. H. WARREN, Dairy and Food Commissioner.
 PROF. H. A. SURFACE, Economic Zoologist.
 DR. LEONARD PEARSON, State Veterinarian.

MEETING OF FARMERS' ANNUAL NORMAL INSTITUTE.

PROGRAM OF FARMERS' ANNUAL NORMAL INSTITUTE TO BE HELD
AT WEST CHESTER, MAY 23-26, 1905.

First session convenes Tuesday Evening, May 23, 1905.

. DR. M. E. CONARD, Westgrove, Pa., Chairman.

Call to order 7.30.

Address of Welcome, by Chas. H. Pennypacker, Burgess, West Chester, Pa.

NOTE.—THE GOVERNOR HAS EXPRESSED A DESIRE TO BE PRESENT, IF POSSIBLE, AND IF SO HE WILL MAKE THE RESPONSE TO THE ADDRESS OF WELCOME.

1. "STATE CONSUMPTIVE CAMPS AND CURES." (40 minutes.)
Dr. J. T. Rothrock, West Chester, Pa.
 2. "SPRAYING: HOW, WHEN AND WHAT FOR." (40 minutes, and 20 minutes for questions.)
Dr. J. H. Funk, Boyertown.
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Wednesday Morning, May 24, 1905.

S. S. BLYHOLDER, Neale, Pa., Chairman.

Call to order 9.00.

1. "SOIL BACTERIA AND CULTURES—THEIR RELATION TO LEGUMINOUS PLANTS." (40 minutes, and 20 minutes for questions.)
Prof. T. R. Robinson, Bureau of Plant Industry, Department of Agriculture, Washington, D. C.
 2. "THE PROPER THEORY OF FARM FERTILIZATION." (40 minutes, and 20 minutes for questions.)
Prof. Wells W. Cooke, Washington, D. C.
 3. "THE CULTIVATION OF MUSHROOMS." (40 minutes, and 20 minutes for questions.)
Thomas Sharpless, West Chester, Pa.
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Wednesday Afternoon, May 24, 1905.

REV. T. J. FERGUSON, Mechanicsburg, Pa., Chairman.

Call to order 1.30.

1. "THE ADVANTAGES OF CORN BREEDING TO THE PENNSYLVANIA FARMER." (Illustrated.) (40 minutes, and 20 minutes for questions.)
Prof. Franklin Menges, York, Pa.
- Discussion opened by Henry Forsythe, West Chester, Pa.

2. "POULTRY BREEDING AND SPECIALTY BREEDING." (Samples of fowls used for demonstration.) (One hour, and 30 minutes for questions.)
T. E. Orr, Beaver, Pa.

Wednesday Evening, May 24, 1905.

J. MILTON LUTZ, Llanerch, Pa., Chairman.

Call to order 7.30.

1. "CONSOLIDATION OF RURAL SCHOOLS." (40 minutes.)
Mrs. Mary A. Wallace, Ellwood City, Pa.
2. "FARMERS' INSTITUTES—THEIR VALUE AND PLACE IN PUBLIC EDUCATION." (One hour.)
Prof. John Hamilton, Department of Agriculture, Washington, D. C.
3. "ADVANTAGES TO BE DERIVED FROM THE CENTRALIZED AND TOWNSHIP SCHOOLS." (60 minutes.)
Prof. Samuel B. Bayle, Superintendent of Erie County Public Schools, Fairview, Pa.

GENERAL DISCUSSION.

Thursday Morning, May 25, 1905.

WATSON T. DAVIS, Ivyland, Pa., Chairman.

Call to order 9.00.

1. "METHODS OF INSTITUTE WORK."
Mr. M. S. McDowell, State College, Pa.

Note.—Session devoted to discussion of questions relating to the local management of institutes, including the work and duties of the County Chairman and his responsibility, and what should be the leading topics for discussion at the coming institutes. Session is open for five-minute talks from County Chairmen, Institute Lecturers, and others interested.

Thursday Afternoon, May 25, 1905.

M. N. CLARK, Claridge, Pa., Chairman.

Call to order 1.30.

1. "DOUBLING CROPS IN MARKET GARDENING." (40 minutes, and 20 minutes for questions.)
Hon. R. F. Schwarz, Analomink.

2. "TILE DRAINING: WHY AND HOW." (40 minutes, and 20 minutes for questions.)

Dr. I. A. Thayer, New Castle, Pa.

3. "GROWING EARLY VEGETABLE PLANTS." (40 minutes, and 20 minutes for questions.)

Prof. R. L. Watts, Scalp Level, Pa.

Thursday Evening, May 25, 1905.

P. S. FENSTEMAKER, Allentown, Pa., Chairman.

Call to order 7.30.

1. "THE HORSE." (Illustrated.) (One hour.)

Dr. Leonard Pearson, State Veterinarian,
Harrisburg, Pa.

2. "BIRDS AND INSECTS." (Illustrated.) (One hour.)

Prof. H. A. Surface, Economic Zoologist,
Harrisburg, Pa.

Friday Morning, May 26, 1905.

C. B. HEGE, Marion, Pa., Chairman.

Call to order 9.00.

1. "CHALK TALK ON THE DAIRY COW." (Illustrated.) (45 minutes, and 30 minutes for questions.)

J. D. Detrich, West Chester, Pa.

2. "WHAT SHALL WE TEACH?" (40 minutes.)

J. H. Peachey, Belleville, Pa.

3. "SWINE—THE RELATION OF FOOD TO GROWTH." (40 minutes, and 20 minutes for questions.)

Prof. G. C. Watson, State College.

PROCEEDINGS OF THE FARMERS' ANNUAL NORMAL INSTITUTE HELD IN MEMORIAL HALL, WEST CHESTER, PA., MAY 23-26, 1905.

Memorial Hall, West Chester, Pa.,
Tuesday Evening, 7.30 o'clock, May 23, 1905.

Dr. M. E. Conard in the Chair.

The CHAIR: The address of welcome will be given by Charles H. Pennypacker, Burgess of West Chester, Pa.

Mr. Pennypacker's address is as follows:

ADDRESS OF WELCOME.

BY CHARLES H. PENNYPACKER, *Burgess, West Chester, Pa.*

Mr. Chairman, Ladies and Gentlemen: On behalf of this municipality of 10,000 people, I extend to you gentlemen, and ladies also, a cordial welcome to our town.

When William Penn stepped for the first time on the shore of Pennsylvania, he turned to his clerk, Caleb Husey, and said to him, "This is a goodly land, what shall we call it?" And Caleb promptly replied, "Chester, after the place in England from whence we came." That name was conferred upon the mother county of this great Commonwealth, and I think that that county thus named, has for two centuries exercised considerable influence in the management and direction of affairs in the Keystone State.

It was a President of the United States who said that agriculture was the grand work of the nation, and all the world smiled at General Grant's quaint remark. It was, I think, then, it had been true for centuries and it is true to-day.

Now, my friends, the hopes, the hearts, the good wishes of the people of this Commonwealth are centered in the farmers' homes of Pennsylvania. Upon the escutcheon of this Commonwealth is indelibly stamped the plow, the oldest, the most useful, the most honored implement in all the history of agriculture; and in this old county of Chester of 720 square miles, containing about ninety thousand people, the agricultural interests are predominant, and to the

farmers of Chester county we look for all that is progressive, for all that is earnest, for all that is sincere, for all that is real in the advancing movements of this advancing age.

True it is we have had a pest called the scale, and that scale is to be found upon many of the alleged statesmen in this Commonwealth. Now that scale needs to be sprayed; these statesmen need to be treated to a shower bath of public opinion, and that spraying and that bath and that evidence of public opinion, is to come from the farmers of Pennsylvania, and you will find plenty of them in the county of Chester, my friends, who own themselves, who listen to no dictation from any alleged superior power. When I look over this great Commonwealth and observe its present condition, I am free to say to you that in Pennsylvania there is no Republican party; it is in the hands of a sequestrator, and has only reached the first stage of having an inventory taken of its assets. There is no Democratic party, for it is in the hands of a receiver and they don't know it. There is only one party in Pennsylvania, and that is the party of the people, and a "government by the people and for the people shall not perish from this earth," so long as the husbandmen retain their independence in action, in character and in achievement. The world cares nothing for what people say; it is what they do. They point to the fact, to the achievement, to the result, not to the spoken word; not to the wind-work that goes on all over this State. Where you find a man saying what he is going to do, you rarely find that he has done it, so that at last good government stands upon the basis of independent individual action, and I care not what may be said from this platform, we want results, we want achievement, we want some forward, progressive movement that will count for something upon the pages of contemporaneous history.

Now, my friends, I only desire to say this in conclusion. Do not be a lot of Jeremiahs; do not be a lot of lineal descendants of the prophet of Lamentations. The times were never better than they are to-day because the people were never better. There never was greater prosperity in this Commonwealth than there is at this time. It is always better to look upon the bright side, the hopeful side, the cheery side of things. We are not a mass of rotten grafters in Pennsylvania, but we are a mass of people desirous of bettering our condition. Genius means energy and industry. Knowledge is not a synonym of laziness and inattention to sanitary details. What we want is to get results. Be cheerful. You are better housed, better fed, better clothed, live longer, have more money and more comforts than your fathers. We want to move along the car of human progress. That poet—that Robert Burns of America whose lines have reached every heart—has said, I quote from James Whitcomb Riley:

"Then one and all, let us be contented with our lot,
 This beautiful May morning, the sun's been shining hot.
 Let us all fill our hearts with the glory of the day,
 And banish every care and doubt and sorrow far away.
 Whate'er our occupation, with Providence for guide,
 In such fine circumstances let us be satisfied.
 The world is full of roses, the roses full of dew,
 The dew is full of heavenly love that drips for me and you."

The CHAIR: It was the Governor's desire to have been here this evening, in which case he would have responded to the address of welcome. Unfortunately he has not found it convenient to be here, but we are fortunate in having with us one of his cabinet, the Secretary of Agriculture, Hon. N. B. Critchfield, and in the absence of the Governor, I will call upon him to make the response.

RESPONSE TO ADDRESS OF WELCOME.

BY HON. N. B. CRITCHFIELD, *Secretary of Agriculture.*

Mr. Chairman, Ladies and Gentlemen: The good Book says, "Let every one be subject to the powers that be," and the powers that be, it seems have decided that I shall take the platform.

And now, Mr. Burgess Pennypacker, and citizens of West Chester, and Chester county, I cannot say that it is with pleasure that I rise to respond to the very excellent and forcible address of welcome to which I have just had the pleasure of listening, because it is somewhat embarrassing to any one to be called on in this summary way. I am glad, however, to be here, and I am glad to have heard a part of the address of welcome. I was unfortunate enough to be called away about the time the address was begun to answer a call at the telephone, so that I only heard a part, and that was the latter part of the address, hence it is going to be very hard to respond to it intelligently under the circumstances.

We are very glad to accept the assurance of a welcome to this town and to this county. You know that people always estimate the welcome that they receive according to the estimate they put upon the people from whom that welcome comes, and if we are to appreciate our welcome in the same way, our appreciation of it must be very high indeed, for coming to you, Mr. Burgess, as we do from all over this great Commonwealth, we feel much like members of the same family, coming to visit a parent; or if not a parent, at least an older brother or older sister, for we are not forgetful that Chester county was the first county organized in the Commonwealth

of Pennsylvania. We are not forgetful of the fact that the first settlement made in Pennsylvania was made in Chester county and it was only a few miles south of this place where William Penn landed when he came from England and began his work in this great Commonwealth; so we are here from the sixty-seven counties of the State to visit this first county, or the older sister, or the one that we recognize as the mother of us all. And you know the wise King of Israel said that the "hoary head when found in the way of righteousness was a crown of glory," so we come here recognizing that this crown of glory is resting upon you, for you are the older sister or older brother of the family.

Reference was made in the address of welcome to which we listened, to the fact that this is a great agricultural county, and for this reason we take pleasure and satisfaction in receiving the welcome you have given. We feel that you are engaged in the same pursuits in which we are interested. We are here as a body of farmers, and you know, friends, the old saying that "birds of a feather flock together," and so we shall feel especially at home among you. We know that this is a great agricultural county, perhaps the greatest in the Commonwealth. We are all aware of the fact that at the last census, Lancaster county was reckoned to be the greatest agricultural county in the United States—in the whole country, but I doubt not if the estimate were made according to number of square miles in Chester county and Lancaster county, the result of that estimate would be in favor of Chester county. You have here the opportunity for, perhaps, the most diversified agriculture that can be followed in any part of the State. You certainly have every variety of soil, from the rich, micaceous soil found in the southern borders of your county, to the heavy and the rich limestone soil of the great Chester Valley which is just north of us, so that here we have an opportunity for almost every kind of agriculture. Why, I can remember when I was a boy of hearing of the immense fields of corn that were raised in Chester county. I can remember the time when we, in the western part of the State sold our cattle to dealers who brought them here to be fed by Chester county farmers. I can remember, before occupying the official position that I now occupy, of hearing of the magnificently equipped dairies here in Chester county, the best perhaps that can be found anywhere in this Commonwealth, if not the best in the United States.

I can remember, moreover, in my boyhood days of having the opportunity to see three of the finest herds of Shorthorn and Durham cattle ever brought into Somerset county, and they were brought from Chester county. The Jerseys and Guernseys have found their way from this county into the central and western counties of

the Commonwealth, therefore, you see I am not mistaken when I speak of your opportunities for diversified agriculture. You have these opportunities here, and I am glad to see that the farmers of Chester county know how to improve them. Why the fact that your lands have been under cultivation for over two hundred years and are richer to-day than they were a century ago, proves to us all that the farmers of Chester county understand their business, and so we are glad to be with you and accept this welcome from such a class of people as we find here.

Moreover, Mr. Chairman, we are not unmindful of the fact that we are here upon historic ground. You will remember that when in the youth of Moses, the Lord appeared to him at Mount Horeb, he was told to put off his shoes from off his feet, for the place upon which he stood was holy ground, and it is with a feeling somewhat akin to this which must have been experienced by the old Hebrew lawgiver that we come into your midst on this historic ground. We remember that the soil upon which we stand when we are in Chester county was baptized with the blood of our fathers in their momentous struggle for Independence. We remember that here some of the most important battles of the war that resulted in American Independence took place. We are perhaps not much more than half a dozen miles from the field of the Battle of Brandywine, where, on the 11th of September, if my memory fails me not, 1777, General Washington with the patriots that followed him, fought; and then just a little way on the north side of us is Paoli, the place where that memorable massacre occurred, only a few days after the battle of Brandywine. And then if we go just a little further off in a northeasterly direction, we come to Valley Forge, where perhaps the greatest amount of suffering and sacrifice was endured by our Revolutionary fathers, that was experienced through the eight years that the struggle for Independence drew its bloody length along, and so we are glad to be here because we feel that we are standing upon historic ground.

Some one has said that the plains of Moab speak to us across the ages, and so my friends it is with Brandywine and Paoli and Valley Forge. They are an inspiration to the lovers of liberty in every age and we are glad to be here. We are glad to be here where our fathers fought for Independence. But there are other reasons, if I had time to enumerate them, why we should be glad to be here and why we should appreciate this welcome. Chester county is not only a great agricultural county, is not only a great historic county, but it is a county that in the past has been great in its production of men. I think it was Wendell Phillips who, when he was visited once by some of his friends who lived some distance away from him, had his attention called to the fact that they had in his community,

in all sections of the country over which they traveled, remarkably good schoolhouses. His friend said to him: "I notice your barns are of moderate size, and that your houses are not extravagant in their architecture, but I admire your schoolhouses; they furnish a contrast to your barns." Mr. Phillips turned to him and said: "We raise men; we pay more attention to raising men than to raising cattle." And so while you have raised your Shorthorn cattle and your Guernseys, and your Conestoga horses, for I can remember when they were brought from Chester county up into the western part of the State, you have also been raising men, and we are standing here to-day where men such as Anthony Wayne, whose name adorns some of the brightest pages of our country's history, was born and reared. Only a few miles south of us is the home of Bayard Taylor, a statesman and a traveler and a journalist and an author, a man whose name will live while the English language is spoken or written in any land; and there are many others. I might name among them the Kents and Swaynes and the Cooks, and others who have added very materially to the literature of this Commonwealth, and of this country, and so we are glad, citizens of Chester county, to be here as your guests, and to express our appreciation of the welcome that has been so eloquently and forcibly expressed in the speech to which we have listened.

The CHAIR: Before proceeding with the program, I think Mr. Martin would like to make some announcements.

MR. MARTIN: As this is the opening session of our Farmers' Normal Institute, it would be but proper that at this session there should be appointed a committee on questions. As you are well aware, if this meeting is to be profitable to us, the interesting part—one of the most interesting for ourselves—will be the questions and the answers that may be developed upon the subject-matter of the topics discussed at the various sessions of this meeting, hence I take the liberty to appoint Mr. Norris G. Temple and Mr. George F. Barnes as an institute committee to distribute the blanks and gather up the questions, and we request that the persons who have questions they wish answered, will write them on these blanks, sign their names and address, so that we may know by whom they are presented. We make this request in order that when the proceedings are published, the name and address of the person handing in a question may also be published with the proceedings and with the answers.

I might state at this time, that to-morrow at twelve o'clock, through the generosity of Mr. Kates, the proprietor of the "Harvest Home Farm" some eight miles distant, we are all invited to be his guests, and transportation will be provided in front of the Hall to-morrow

at twelve o'clock to convey the members of this convention to that farm, and through the generosity of Mr. Kates we will partake of a lunch and hold our afternoon session there. The program will be just a little changed. If you will notice, Mr. Orr is on the program for an address on Poultry Breeding. His place on the program will be omitted and Mr. Schwarz will take his place. Mr. Orr's topic includes the exhibition of poultry here and cannot be given out at the farm. This, however, can be announced a little later. I think there is nothing at this time that I need to say, except to simply notify the members of this convention who have not yet registered, to come forward at the close of this meeting and register and receive a badge of membership. We will call no roll to-night, but this will enable us to make up the roll so that it can be called at the proper time.

From the register it was found that the following Institute Managers were present:

County.	Name and Place.
Adams,	A. I. Weidner, Arendtsville.
Allegheny,	J. S. Burns, Imperial, R. F. D. No. 1.
Armstrong,	S. S. Blyholder, Neale.
Bedford,	S. S. Diehl, Bedford.
Berks,	Howard G. McGowan, Geiger's Mills.
Blair,	H. L. Harvey, Kipple.
Bradford,	E. E. Chubbuck, Rome, R. F. D. No. 16.
Bucks,	Watson T. Davis, Ivyland.
Butler,	W. H. H. Riddle, Butler.
Cameron,	W. H. Howard, Emporium.
Carbon,	J. A. Werner, Weatherly.
Chester,	Dr. M. E. Conard, Westgrove.
Clarion,	S. X. McClellan, Knox.
Clearfield,	J. W. Nelson, Shawville.
Clinton,	Joel A. Herr, Mill Hall, R. F. D.
Columbia,	A. P. Young, Millville.
Crawford,	M. W. Oliver, Conneautville.
Cumberland,	Rev. T. J. Ferguson, Mechanicsburg.
Dauphin,	S. F. Barber, Harrisburg.
Delaware,	J. Milton Lutz, Llanerch.
Erie,	Archie Billings,, Edinboro.
Fayette,	Sylvester Duff, Smock.
Franklin,	C. B. Hege, Marion.
Fulton,	R. M. Kendall, McConnellsburg.
Greene,	J. W. Stewart, Jefferson.
Huntingdon,	Geo. G. Hutchison, Warrior's Mark.
Indiana,	S. M. Henry, Indiana.
Juniata,	Matthew Rodgers, Mexico.
Lackawanna,	Henry W. Northup, Dalton.
Lancaster,	W. H. Brosius, Drumore.
Lawrence,	Samuel McCreary, Volant.
Lebanon,	Edwin Shuey, Lickdale.
Lehigh,	P. S. Fenstemaker, Allentown.

County.	Name and Place.
Luzerne,	J. E. Hildebrandt, Dallas R. F. D.
Lycoming,	A. J. Kahler, Hughesville.
Mercer,	W. C. Black, Mercer.
Mifflin,	M. M. Naginey, Milroy.
Montour,	C. A. Wagner, Ottawa.
Northampton,	Wm. F. Beck, Easton, R. F. D.
Northumberland,	J. A. Eschbach, Milton, R. F. D. No. 1.
Perry,	A. T. Holman, Millerstown.
Philadelphia,	J. B. Kirkbride, Bustleton.
Pike,	B. F. Killiam, Paupack.
Potter,	Horace H. Hall, Ellisburg.
Schuykill,	W. H. Stout, Pinegrove.
Snyder,	Charles Miller, Salem.
Somerset,	Jacob S. Miller, Friedens.
Sullivan,	J. K. Bird, Dushore, R. F. D. No. 3.
Susquehanna,	Dr. E. E. Tower, Hop Bottom.
Tioga,	F. E. Field, Wellsboro.
Union,	J. Newton Glover, Vicksburg.
Venango,	W. A. Crawford, Cooperstown.
Warren,	{ George A. Woodside, Sugargrove. R. J. Weld, Sugargrove.
Washington,	D. S. Taylor, Raceoon.
Wayne,	W. E. Perham, Niagara.
Westmoreland,	M. N. Clark, Claridge.
Wyoming,	D. A. Knuppenburg, Lake Carey.
York,	G. F. Barnes, Rossville.

Of the Institute Lecturers, the following were present:

Barber, Spencer F., Box 104, Harrisburg, Dauphin county.
 Beardslee, R. L. Warrenham, Bradford county.
 Black, W. C., Mercer, Mercer county.
 Bond, M. S., Danville, Montour county.
 Brodhead, C. W., Montrose, Susquehanna county.
 Brubaker, A. L., Hogestown, Cumberland county.
 Burns, J. S., Imperial, R. F. D. No. 1, Allegheny county.
 Butz, Prof. George C., State College, Centre county.
 Campbell, J. T., Hartstown, Crawford county.
 Clark, M. N., Claridge, Westmoreland county.
 Conard, Dr. M. E., Westgrove, Chester county.
 Cooke, Prof. Wells W., No. 1328 Twelfth street, N. W., Washington, D. C.
 Cox, John W., New Wilmington, Lawrence county.
 Cure, Z. T., Jermyn, Lackawanna county.
 Detrich, J. D., West Chester, Chester county, R. F. D. No. 12.
 Drake, W. M. C., Volant, Lawrence county.
 Foight, John G., Export, Westmoreland county.
 Funk, Dr. J. H., Boyertown, Berks county.
 Hall, Horace, H., Ellisburg, Potter county.
 Hantz, Prof. J. M., Merrittstown, Fayette county.
 Harshberger, J. W., Ph. D., Philadelphia.
 Herr, Joel A., Mill Hall, R. F. D., Clinton county.
 Hill, W. F., Chambersburg, Franklin county.
 Hoover, Hon. E. S., Lancaster, Lancaster county.

Hull, Geo. E., Transfer, R. F. D., Mercer county.
 Johnston, J. B., New Wilmington, Lawrence county.
 Kahler, Hon. A. J., Hughesville, Lycoming county.
 Ledy, J. H., Marion, Franklin county.
 Lehman, Amos B., Fayetteville, Franklin county.
 Lighty, L. W., East Berlin, Adams county.
 McDonald, John T., Delhi, N. Y.
 McDowell, M. S., State College, Centre county.
 Menges, Prof. Franklin, York, York county.
 Northup, Henry W., Dalton, Lackawanna county.
 Orr, T. E., Beaver, Beaver county.
 Owens, Prof. Wm. G., Lewisburg, Union county.
 Peachey, J. H., Belleville, Mifflin county.
 Phillips, Hon. Thomas J., Atglen, Chester county.
 Schwarz, Hon. R. F., Analomink, Monroe county.
 Seeds, R. S., Birmingham, Huntingdon county.
 Stout, W. H., Pinegrove, Schuylkill county.
 Stuart, R. R., Callensburg, Clarion county.
 Surface, Prof. H. A., Economic Zoologist, Harrisburg.
 Wagner, F. J., Harrison City, Westmoreland county.
 Watts, Prof. R. L., Scalp Level, Cambria county.
 Waychoff, G. B., Greene county.
 Watts, D. H., Kerrmoor, Clearfield county.
 Wallace, Mrs. Mary A. ("Aunt Patience"), Ellwood City, Lawrence county.

The following visitors were present:

Name.	Place.
Mrs. W. H. Howard,	Emporium.
Mrs. T. E. Orr,	Beaver.
Mrs. Norris G. Temple,	Pocopson.
G. R. Hendricks,	Selinsgrove.
Mrs. Wells W. Cooke,	Washington, D. C.
Horace Seamans,	Factoryville.
Wm. K. Miller,	Salem.
M. P. Hollowell,	Ivyland.
H. W. Hollowell,	Ivyland.
Alfred Hollowell,	Marshallton.
H. M. Wingert,	Fayetteville.
Mrs. H. G. McGowan,	Geiger's Mills.
Mrs. W. F. Beck,	Easton.
Mrs. M. E. Beck,	Easton.
Mrs. T. J. Phillips,	Atglen.
Thomas Sharpless,	West Chester.
Edward Walter,	West Chester.
R. F. Lee,	State College.
E. L. McKinstry,	West Chester.
Thomas S. Butler,	West Chester.
Geo. A. Hoffman,	West Whiteland.
Victor Brinton,	Pocopson.
Miss Mary Seeds,	Birmingham.
Samuel L. Brinton,	West Chester.
Alva Agee,	Wooster, Ohio.
Henry Forsythe,	West Chester.
W. J. Johnston,	New York City.

Name.	Place.
Mrs. Samuel L. Bayle,	Fairview.
L. R. White,	State College.
E. F. Hay,	State College.
F. J. Zuck,	State College.
Henry Palmer,	Avondale.
Hon. Franklin Dye,	Trenton, N. J.
E. S. Bayard,	Pittsburg.
Miss Alma Kahler,	Hughesville.
Miss Grace Whiteley,	Philadelphia.
Wm. Howard,	Emporium.
B. F. Powell,	West Chester.
H. D. Ingram,	West Chester.
Chas. H. Pennypacker,	West Chester.
Mrs. Chas. H. Pennypacker,	West Chester.
J. E. Hoffman,	West Chester.
Mrs. M. A. Hoffman,	West Chester.
Samuel R. Downing,	Downingtown.
John I. Carter,	West Chester.
Hon. W. L. Amoss,	Benson, Md.

BURGESS PENNYPACKER: I hope that all those who possibly can will accept the invitation extended by Mr. Kates. You will see farming land in Chester county that has been continuously farmed for more than two centuries, and you will also visit or pass over some of the historic revolutionary ground in this county in going to his farm and returning from it.

The CHAIR: We are fortunate enough to have with us Miss Ethel Patterson, who will favor us with a vocal solo.

Miss Patterson, a member of Goshen Grange sang very sweetly, "Sweet Clothilde, Come With Me." Her accompaniment was played by Miss Kleinert, of Darlington Seminary. Being encored vigorously, Miss Patterson responded, by singing "Sweetest Lilli Fella," which was equally well received.

The CHAIR: You will now have the opportunity of listening to a lecture that is of infinite interest to all of us, "State Consumptive Camps and Cures," by Dr. J. T. Rothrock of West Chester.

Dr. Rothrock spoke as follows:

STATE CONSUMPTIVE CAMPS AND CURES.

BY DR. J. W. ROTHROCK, *West Chester, Pa.*

No case of consumption ever was cured by drugs. Now do not misunderstand me. I do not mean for one moment to underrate the important part that the medical profession can and does play

in the eradication and extermination of this disease. It is to trained physicians that we are indebted for the exact knowledge we possess of what the disease consists of. It is to trained physicians to-day that we are indebted for the best knowledge of the best means of treatment. But I believe that I have expressed the consensus of the best medical opinion when I say to you again, as I have just said, that no case of tuberculosis ever was cured by drugs.

I can very well remember fifty years ago of hearing my father, who was an honored country doctor, say, that if a certain patient of his could go into the coal regions, as they were called, that is, the places where charcoal was burned in the woods, that he would have a chance to get well. At that early day people recognized the fact that in these coal regions cures occurred. They attributed the good results to inhaling the fumes and the dust of the burning charcoal. We know that charcoal is carbon, and it makes very little difference so far as the irritation of the lungs is concerned whether it is in the form of charcoal or in the form of bituminous coal; in either case it is an irritant. This shows how close men may be to a great truth but not quite recognize it. What was the actual beneficial agent in this case? Those charcoal burners set up a little cabin where a mere screen intervened between the cold winter and the heat of summer, with an open fireplace and with a bare apology for a chimney, and whether they would or not, those who lived in those cabins, practically lived in the open air. There was the explanation of the whole thing—the open air. In 1873, I was acting as assistant surgeon of the United States Engineer Corps and we were then operating in Colorado. There were with me two men, one of them a very distinguished scientist; the other a private soldier. The former had been sent to Colorado with the idea that a life in the open air might help him. The diagnosis in the case of the scientist had been given by the most eminent authorities in New York City. The other case had been diagnosed by a most accomplished man and they had sent this private out to Colorado because they did not want to bury him at Fort Leavenworth. Both of these men are alive to-day. The one gained twenty pounds and took no medicine; the other gained forty and gained it in spite of the whiskey he drank. I could not help asking myself the question whether the beneficial effects of the open air were confined to Colorado. As a Pennsylvanian I came home and in 1876, placed a brother physician in the hemlock wilderness of Sullivan county. He stayed there in the open air without medicine and almost without care and in two months gained enough strength to return and continue his practice and then go to Cuba and die.

Now as Commissioner of Forestry, I found myself three years ago in charge of 600,000 acres of land. It belonged to the people of the

State; was purchased with their money and paid for by them. They were entitled, I felt, to every benefit they could receive from it, which was not in opposition to the purpose for which it was purchased, namely, forestry, and it occurred to me to see whether or not we could not open this Pennsylvania wilderness for those who could not go to California, or to the Adirondacks or to North Carolina. We have had in that camp ninety-four patients and we have sent away from there sixty-seven per cent. cured. There has not been a gallon of cod liver oil used, there has been almost no medical treatment. When I say sixty-seven per cent. cured, I mean actually cured or so far restored that their recovery is a question of time.

Now I have not a word to say against White Haven. I shall confine my remarks, however, to the work at Mont Alto. I recognize to the fullest extent the magnificent work and splendid achievement at White Haven. The results which have been accomplished there are such as any country may well be proud of. I say then, that pure air is the one active agent in the restoration of consumptives to health.

Now in our little mountain home, we had at first a few cabins made out of second-hand lumber. I hadn't a dollar to build with when we commenced this work. We tore down some old houses and carted them to the top of the mountain; a man who was willing to live in a building of that kind would not be a desirable resident on State land. I tore down these old houses and carted them to the top of the mountain, and begged the money to put up these cabins, ten feet square with a tarred paper roof, with two windows and a door, without a speck of carpet, with whitewashed walls, and then a coat of brown building paper over it. A stove and a lantern and a chair completed the outfit. Now I could tell you of cases from this county; one palefaced boy with death written all over his countenance, whose own mother said to me, "My son will not be alive in two months," but that same boy was sent home a short time ago, a ruddy, healthy boy, cured. We of course have had our disappointments, but the good results have enormously outweighed the bad ones.

I want to give you just a few cases, that I have in my mind now. One man came to us weighing 140 pounds, his normal weight being 180 pounds. He gained on the average seven pounds a week. He came to us saturated with malaria which had to be gotten rid of by treatment. After that, he had no medicine. He ate eggs and drank milk, and he consumed quantities of beef, which stagger belief—seven pounds a week. Another man came to us from over here in Montgomery county. He had been living out doors, living in a tent, but was steadily going down. After he came to us, in thirty-eight days he gained thirty-eight pounds and a half, and is now home at

his business, well. Another case comes to my mind. A case which had had so many hemorrhages that we doubted the expediency of receiving him. He had had hemorrhage after hemorrhage and was a mere wreck and shadow when he came to us. He was with us between two and three months and he gained twenty-five pounds and then left because he hadn't the means to remain longer, but he is now back again.

These are some of the cases that we have had there from which have worked out good results. If I had time I could cite other cases to you which would prove the good results of the open air treatment, but I want here to allude to the work that the women of the State have done. Last October I went to the camp from which I had been absent a few days and found that the inmates were in a freezing condition. Many of them were too poor to purchase wood; there was not a stick of wood in that camp. I did not believe that the Lord would allow work of that kind to fall through, and without the promise of a cent, without knowing where the money was to come from, I got on my horse and ordered wood right in; didn't delay a minute, and it came in and by night we had several cords of wood in and men at work to cut it, and from that time until spring warmed up the earth with the hearts of the people, we were never out of wood in our camp, when we didn't have anything in the way of fuel to keep that camp warm, and it was all due not to the benevolence of the men of the State, but every cent of it to the devoted women of this Commonwealth.

I want to say, furthermore, that when I started to build those cabins I hadn't a cent of money to build them with. I went to a lady in Harrisburg and told her what I wanted to do, and she immediately subscribed herself, and went out among her friends, and before twenty-four hours I had all the money necessary to put up ten cabins. I have now got more money for the running of that camp than I ever had before and every cent of it has come from the women of the State.

Now the location has something to do with the cure of consumption. It is true people can get well right in their back yards. There are many of them getting well there now right in this county. But location has something to do with it. Take for example the person I spoke of in Montgomery county who was steadily going down until he came to the mountain home at Mont Alto and gained thirty-two and a half pounds in thirty-eight days and is now permanently well. You asked me the question, are these cures permanent? My friends, in some cases they are absolutely permanent; in other cases it depends. Then you say, "Well, it depends." You might put that proposition in another way, my friends. Suppose you were condemned to be hanged to-morrow morning, and word was to come from

the Governor saying, "I will reprieve you as long as you will live outdoors." I think you would never die by hanging even if you were obliged to swelter in summer and shiver in winter. Some people may have to stay out doors. It may be necessary for them to do that to save their lives. On the other hand, persons may live in the best atmosphere the country affords and yet die with consumption. I have in my mind now a family of strong, hearty, vigorous people apparently, living right under the shadow of these health-giving mountains and yet every member of that family dies before they reach old age from consumption. Now why have they done that for generations right there in that healthy climate. Why have they done it? Because of the dread they have of fresh air. They are afraid of a draft, afraid to open their windows. Why the most delicate person we have had in camp is not afraid of a draft or an open window or the night air. Some people are so afraid of the night air, when the night air is the only air we have in the night; it is a mere bug-a-boo. There is nothing in it. It is only the person who lives in a close room, and perhaps over-heated and afterwards goes out into a cold temperature that catches cold. What sort of a man do you think that would be who could stand with not a moment's notice a translation from Greenland down to the equator? That is practically what you do everytime you go out of a super-heated house in the winter, and what can you expect? A person who lives out doors is the one who never catches cold.

Now why are these consumptive camps located on a reservation? I know there has been, to a certain extent, opposition to this, and opposition I may say on the part of the highest dignitaries of the State. In the first place, these reservations were purchased with the idea of forest restoration and they belong to the people of this Commonwealth. They were purchased for their interest and paid for with their money, and if there is any good that they can get out of these reservations without interfering with the purpose for which they were purchased, I think they are entitled to it.

Now there is another reason why these consumptive camps should be located on the reservations. A short time ago I proposed to purchase a piece of ground along the Brandywine for the purpose of opening a consumptive sanitarium, and I was not very long in finding out that the investment on my part would not be regarded with any favor with the neighbors. They didn't want a consumptive sanitarium there. I don't blame them very much. I would not like to have a contagious disease in the vicinity of my family if I expected to live there. Now the isolation that we have in these forest reservations is complete. We are interfering with the rights of nobody. Nobody wants to live there. We stand on an elevation and we look

out over miles of forest land. There is not a factory chimney in sight, and every breath that you take in comes to you through miles of foliage, and that is the place, if there is anything in environment, to put these consumptives. That is the place where they are the least trouble, and where they have the largest chance of recovery.

There is still another reason to be considered in the establishment of these consumptive sanitariums. We find that the question arises: What are we to do with those we have cured, or so nearly cured that they can be trusted to send out? We can't send them back into the cities, into the slums; because if we do, all this work will have to be done over; it is wasted. Why can't we have farms where these people can work out doors? Why can't they be put to work? There is no reason why not, but there they would be again a nuisance, an offense to the neighborhood. You have got to buy the farms, first of all. Now the State has got this land and we need people there to help fight forest fires in the spring, and to act as watchmen. We can plant basket willows and grow the materials to make baskets which can be sent out and sold. Millions of white pine ought to be grown every year for gratuitous distribution over the Commonwealth. These people can do that and earn their living and be out of everybody's way. It seems to me that it is a plan that would help everybody, hurt nobody and please God.

Now, my friends, I very well remember the time when we had in this country what we called the black plague. I do not mean the black plague of slavery which was cursing the country North and South, and continually acting as a bone of contention between the different portions of this land. I remember how the loyal hearts of the North arose, and ended the question forever, and we banished the black plague. Now the white plague of consumption is a plague which can be just as effectually banished as the black plague of slavery. Every time you go into your house off the street, you carry in the germs of this disease. You have got the poor victims of this disease scattered in communities and in hospitals; you can't get rid of it; the poor you have always with you. Wouldn't it be better to take hold of these cases in their early stage and restore them to the ranks of usefulness, of honorable, healthful citizenship? It can be done. Seventy per cent. of the cases of incipient tuberculosis should be cured. Ordinary attention to the hygienic rules and the prevention of spitting on the sidewalks, would tend to make the atmosphere so healthful that no case of consumption would ever be started.

I want to give you a little instance that came to my notice a short time ago. I was on a train where there was a lady with several children and one of them had a paroxysm of whooping-cough. The mother sent one of the children up to the cooler to get a glass of

water, and that was brought down to the child with the whooping-cough and it took a drink out of the tumbler; then everyone of the others, three children, took a drink from this same tumbler, and then the mother took a drink out of the tumbler and then the tumbler was placed back on the stand by the cooler. Now there are other diseases such as you are exposed to in similar ways, just as you are exposed to tuberculosis.

I think one of the best investments Pennsylvania ever made was the appropriation of \$8,000 for the creation and maintenance of this camp. It has taught the citizens of this Commonwealth who are too poor to go the required distance to health resorts and who are afflicted with this dreadful disease, that they can be cured. It has taught these people to look to the everlasting hills of this Commonwealth with hope and reasonable expectation that they may be cured. If it has done nothing else than to teach our people to live out of doors, it has done a noble work.

The CHAIR: We are now to be favored with another piece of vocal music by Miss Ethel Patterson.

Miss Patterson sang a ballad entitled "Tony and Dons," which was greeted with vigorous applause.

A Member: Doctor, will you please state the elevation of your Sanitarium at Mont Alto?

DR. ROTHROCK: 1,660 feet.

MR. CLARK: I have been very much interested in the consumptive lands in North Carolina and would like to inquire whether you have made any comparison with reference to the two places.

DR. ROTHROCK: I have not except in results. I believe that our results are about the same as in North Carolina. I should say this: Ours is simply a camp where we do not feed the patients. We have not the money to feed them. If we could give them at least one square meal a day, no doubt we could produce still better results, for everyone knows that the mere effort to prepare food, destroys the appetite. The question of cure for consumption is really a war between repair and destruction, so that it amounts to a question as to whether you can get food enough taken and assimilated to build up faster than you tear down.

A Member: What is the lowest altitude you would recommend?

DR. ROTHROCK: Patients sometimes get well at the level of the sea; on the other hand an excessively high altitude is often a very dangerous one. We had one young man who did not do so

well as in Philadelphia, and he was sent to Colorado and died within forty-eight hours after he arrived there.

BURGESS PENNYPACKER. Won't you preach the gospel of more fresh air in the farmhouses of Pennsylvania?

DR. ROTHROCK: I would like to see the old fashioned fire-place that our fathers used to have, big enough to put a six foot stick of wood in, in every farmhouse in the land.

A Member: Doctor, do you consider that there is any virtue in cold; a cold temperature?

DR. ROTHROCK: No, I do not. I might tell you of a little incident. When the temperature was fourteen degrees below zero, I met a party of the inmates of my camp going out to have a picnic on the top of the mountain and they went out and stayed there all day, and they came back at night with their tongues out, and nobody was hurt by it, and one of the persons who was in that party was a very delicate lady, who afterwards came to West Chester and took a course of instruction and training as a nurse.

I want to say here that I had four representatives there from a family of thirteen children, the father having died with consumption and the mother with cancer. Eight out of these thirteen children were dead with consumption; one, a man, apparently didn't have it; never showed any signs of it; but four members of that family were in my camp and every one of them have gone away cured, and they have taken no medicine. They have eaten poultry instead of taking medicine; ate raw eggs, drank milk and breathed the fresh air. I believe in their taking this kind of food; all they can hold of it.

Now I am a doctor myself, and I want to say here, that I believe I express the sentiments of the best of our medical profession to-day, when I say that no case of consumption ever was cured by drugs. There are cases when medicine is best, but not for the cure of consumption. A consumptive may have various other troubles, and we may treat him for those and frequently do, and that is just where the skill of a trained physician comes in, but I think the majority of physicians have absolutely lost faith in drugs for the cure of consumption.

MR. RODGERS: Doctor, how do you prepare fresh eggs to make them palatable?

DR. ROTHROCK: I think the best way is to simply swallow them as you do an oyster. Just take them into your mouth and let gravity do the rest. Of course, you can flavor your eggs with anything

you like, but we think that a patient who can take a fresh egg as he takes an oyster, is one of our best patients. Just break the egg into a tumbler, tip it up, and let gravity do the rest.

A member inquired as to Cod Liver Oil, to which Dr. Rothrock replied that a pound of butter was worth more than a pound of Cod Liver Oil.

MR. SEEDS: Doctor, you spoke about the old fashioned fireplace. I would like to know if you have any objections to taking cold air from the outside, and putting it through a heater and forcing it up through the house.

DR. ROTHROCK: There is no occasion at all to do that. Why do they make the people in the Adirondacks sleep out with the thermometer twenty-five or thirty degrees below zero? Is there any virtue in cold? No, there is not. It is to make them get all the fresh air they can get. You can't live comfortably if your temperature falls a little below the normal. Such is the force of habit. The first effects of food are to create animal heat and if you live in a temperature twenty-five or thirty degrees below zero, an enormous quantity of that food has to go just to keep you warm.

In our little cabins, only ten feet square, a bunk is built on this side (indicating) and there are two windows, one here (indicating) and the other at the other side. A little stove is right at this window (indicating), when they put a fire in that stove on a cold winter night, it makes that room so hot they have simply got to open the windows and doors so that it lets the air sweep right through that cabin and when the man gets well enough he is made one of our forest wardens, out in all kinds of weather, fighting fire and doing all the work of the State on these forest reservations.

A Member: Doctor, is any more legislation needed to carry out the idea of this work?

DR. ROTHROCK: I think legislation will be needed. I think we have got to take care of these people. I think that the public sentiment, as it has been expressed, is very largely in our favor, and I think that the time is coming when these reservations will be largely used, and I believe that the finances of the State will be sufficient and will be provided to carry on the work.

BURGESS PENNYPACKER: Does the question of heredity have anything to do with the question of consumption?

DR. ROTHROCK: I think it does. I can't explain why, but I know that there are a certain number of children in some families

who, one after another, when they get to about thirty years of age, will die of consumption. The question is, whether we cannot, by living in the open air, overcome the hereditary tendency.

BURGESS PENNYPACKER: I think you can, because my mother died with tuberculosis at fifty-four and I believe I do not exhibit any signs of it at sixty. But we have had the gospel of open air discussed in our family for the last forty-five or fifty years, and we do not believe there is any danger in the night air, for as has been said, it is the only kind of air you can get.

On motion of Mr. Hutchison, duly seconded, a vote of thanks was returned to Dr. Rothrock for his able and instructive address.

The CHAIR: We will next hear from Dr. J. H. Funk, of Boyertown, on "Spraying: When, How and What For."

Dr. Funk's paper is as follows:

SPRAYING: WHEN, HOW AND WHAT FOR.

BY DR. J. H. FUNK, *Boyertown, Pa.*

To the fruit raiser who desires healthy trees with rich, luxuriant foliage, producing annual crops of clean, high-colored, luscious fruit, spraying is no longer an experiment, but as much an actual necessity as is fertilizing and cultivating the soil for the production of maximum crops. There was a time in the early history of our forefathers when the virgin soil was so rich in all the elements of fertility necessary for the best growth of root, stock and seed, that annual applications of manures was not necessary. The soil was full of humus, making it loose and porous, giving access to air and heat, absorbing and holding moisture, that maximum crops were raised with little effort and cultivation on the part of the farmer.

So it was with the fruit raiser. In those early days trees grew spontaneous, maturing fruit in abundance. There were not so many varieties of a high standard as at present, but such as there was (and some of it was excellent) grew without molestation from our insect enemies. Fungi was a thing unheard of by those early pioneers in horticulture. And the few insects that were native

to our country were held in check by the feathered songsters that were so plentiful and made the forest and field cheerful with their bright colors and sweet music. But with the increase of population and advance of civilization the demand was made for more tillable land. Forests were devastated, destroying the nesting places of our feathered friends, and driving the various insects that subsisted upon the wild forest trees to invade our orchards and change their diet from the wild to our cultivated lands.

But this does not complete the story. Our country, this great, grand and glorious country where freedom abounds, has always proven the home for the oppressed of every nation, and as they came pouring in through our open doors from every country they brought with them, not only their own individualities, but germs from Germany, microbes from Ireland and parasites from Paris, and insects from every nation. Our soil and climate proving congenial, they have multiplied to such extent that there is no crop but which is more or less infested and it has become a matter of the "survival of the fittest." He who expects to raise fruit or any other crop on the principles of our ancestors, will find he is up against the real thing; and to become master of the situation he must bestir himself and resort to spraying.

This subject has been so much talked about that you can scarcely pick up a paper, agricultural or horticultural, but you see articles on spraying. Yet it has never been placed in such a light as to fully impress the average mind with its importance. It is claimed there is an annual loss in the United States alone of between 300 and 400 millions of dollars, and that 75 per cent. of this loss could be avoided by judicious spraying. Fruit especially claims more attention than formerly as our insect foes are increasing so rapidly. In the Scriptures we read of the plagues of Egypt. They were scarcely more terrible than the vast army of creeping, crawling and flying insects that have been imported, developed and disseminated, that are biting and sucking and thus destroying the vitality, beauty and luxuriant growth and wealth of fruit. Some of them are sucking insects and must be killed by contact remedies such as L. S. S. soap-suds, kerosene emulsion, crude oil, etc., any oily substance that closes up the breathing pores along the sides of their bodies. Some are masticating insects, eating the leaves, the tender new growth and the fruit. These can be killed by internal poisons, such as arsenite of lead, arsenite of soda, Paris green, hellebore, etc. We frequently hear of dissatisfaction caused by using fungicides for masticating insects, and vice versa.

Insects are classed under two heads: Biting and sucking. Under the first class we have the caterpillar, canker worm, codling moth,

cut worms, wire worms, potato beetle, etc. In sucking insects we have the scale insects, aphids, chinch bugs, etc. So we have with fungus growths wherever it attaches itself on fruit, it prevents the development by sapping the juice or, if on the leaves, it destroys the cellular tissue and prevents the leaves from performing their function, that of preparing the plant food. Leaf blight or scab fungus causes the leaves to drop and the fruit on such trees cannot properly mature. These are best treated with fungicides of which the copper salts are the best.

What is spraying? The forcible ejection of fungicide or insecticide ingredients in such fine or minute particles, whether dust or misty spray, that it will be thoroughly distributed through every part of tree, bush or vine, leaving no part uncovered or uprooted from the ravages of insects or infection by fungi.

When shall we spray? Fruit, for scale, fungi, leaf curl, etc., while the tree is dormant, anytime after the leaves drop in the fall of the year until the buds expand in the spring. At this season the tree, having no foliage to distract, every limb and twig can be reached by the spray, thus destroying all insects and fungi much better than in summer.

For masticating insects, the best time is just after the bloom drops. It might be done while in bloom, but it does in some instances interfere with proper polinization, and destroys one of the best insect friends the fruit raiser has, the honey bee. Wait until the petals fall then spray at once, as the time is short between the dropping of the petals and the closing of the calyx, and a few days delay would be fatal to success. That this second spraying should be done at just the right time is very important, as far as the codling moth is concerned, and should be done inside of ten days, as after the calyx closes it prevents the lodgement of poison, which to be effectual, a small portion must be inside the cavity. The codling moth passes the winter in the pupa state. At the proper time in the spring it is transformed into the moth miller which lays its eggs on the small fruit or nearby leaf. As soon as the warm sun hatches the young insect, it seeks shelter by crawling into the closed calyx and there takes its first meal. If any poison is there its career is soon ended, but if not, then the young worm feeds a few days in the cavity before tunneling into the core of the fruit, which soon loses vitality, becomes yellow and falls to the ground. The larvae then eats its way out, seeks some secluded place, spins itself into its cocoon, passes the pupa stage, and again emerges and produces the second crop of codling moths, showing the importance of doing effectual work in the spring.

There is more failure through lack of thoroughness than almost

any other cause. You need not spray until it drips from the foliage and runs down the limbs and trunk, but every part must be thoroughly moistened. Many orchardists do not know what thoroughness means. A short time back I read an article in a horticultural paper by a fruit grower in the West, stating that an orchard of 20 acres can be best treated by a hand pump, but for larger orchards by using a sprocket gearing attached to the wheel, a pressure of from 80 to 120 pounds could be maintained, and with such a machine with two lines of hose, 4 nozzles, two men and one boy, from 60 to 100 acres could be sprayed in one day. This is very nice in theory, but when you endeavor to put it into practice you see the fallacy. For instance, one acre planted 35 by 35 gives 35 trees per acre; 100 acres gives 3,500 trees. An average tree of 20 to 40 years of age takes 5 gallons at least; that means 16,500 gallons. Now any machine that will throw that amount of material through 4 nozzles is better calculated to put out fires than spray trees.

Let us see what the capacity of a machine is and we will take one of the best, one run by liquid gas with which you can maintain a uniform pressure up to 125 pounds. We will equip this machine with 8 nozzles instead of 4. We will run a uniform pressure of 100 pounds and the utmost that can be forced through the small cap vermorels (and these are the only ones making a perfect mist) is 100 gallons in 20 minutes; that means 300 gallons per hour or 3,000 gallons in 10 hours (any man who has properly handled an 8 or 10 foot extension pole, thinks 10 hours constitutes a legitimate day's work), less than one-fifth of what this man calls for.

Why do editors permit such nonsense to get into their columns? It does incalculable harm, encouraging the beginner to hurry over his trees, wasting his time, money and doing his trees but little good. It is an utter impossibility for any orchardist to spray 10 acres per day and do a good job with one machine; and any machine that does more is better calculated for a road sprinkler or a fire extinguisher. When you see an advertiser guaranteeing his sprayer to spray from 50 to 100 acres per day, pass it by as worthless for your purpose.

What are the results of spraying? It is claimed that any man who has more than 10 per cent. of wormy fruit has not properly sprayed. This I believe to be practically true. To see if this is true, let us investigate the results obtained by careful experiments as carried on at different stations.

By the Geneva Experiment Station, several orchards were sprayed at different localities, widely distributed, to render results more conclusive, as environments often affect results. Number of trees sprayed with sulphur washes were 7,325, consisting of apple, pear,

peach and plum. The washes used were the boiled sulphur wash and the self-boiled lime, sulphur, caustic soda wash.

Results on peach. These trees were infested with San José Scale. The self-boiled wash was used. Careful examination on October 1st failed to reveal any living scale. For peach leaf curl, with exception of a few terminal buds, the sprayed trees were practically free from curl, whereas the unsprayed trees were much defoliated and the trees were in unthrifty condition.

Pear. Applied from 9th to 20th of April, the sulphur wash destroyed the blister mite, also lichens, and left the bark clean, and foliage set after June 15th was still adhering October 20th, while the trees unsprayed were nearly bare.

Apple. On 276 trees, 30 to 50 years old, spraying was begun with the sulphur wash April 7th, continued until April 12th; work delayed every day by rain. Bordeaux arsenical mixture was applied May 18th to 20th, June 2d to 6th, and July 6th to 8th, rainy weather during most of the spraying time. With the picking of the fruit, September 27th, the apples were carefully examined with respect to scale, codling moth and scab.

The outline of their experiments were as follows: Section No. 1, sprayed once with sulphur wash; Section No. 2, sprayed once before buds opened with sulphur wash, and twice after drop of petals with Bordeaux and arsenical poison.

Section No. 3, no treatment.

Section No. 4, sprayed three times with Bordeaux and arsenical; once before and twice after blossoms dropped.

Average of wormy fruit on Section No. 1, 27.6; average of wormy fruit on Section No. 2, 3.6; average of wormy fruit on Section No. 3, 24.3; average of wormy fruit on Section No. 4, 8.9; sound fruit from trees treated with Bordeaux arsenical mixture averaged 93.8 as compared with 74.1 per cent. sound fruit from checks and where treated with sulphur wash alone. The application of sulphur wash greatly reduced the number of scales and gave fruit practically free. The average of infested fruit from sulphur treated trees was 5.3, as compared with 17 per cent. of scaly fruit from untreated trees.

In every instance where the work has been properly done the results have been very satisfactory for scale insects, codling moth and scab.

The Connecticut Experiment Station has likewise been experimenting for several years with different sprays. With the L. S. S., boiled and self-boiled, both have given good results, but on the average, best results have been obtained from the boiled preparation. At the Paragon Fruit Farm we have been spraying for several years, mostly for scale, having tried various sprays with remarkable suc-

cess. Our preference is for the lime, sulphur and salt, boiled. With this we have been able to hold the pest in subjection; so much so that we no longer fear it. We have had trees so badly infested as to be considered hopeless. We not only saved these trees but completely eradicated the scale without the loss of a single crop of fruit and regained the thrift of the trees. Last fall we purchased a new spraying outfit and wishing to test it, we boiled 100 gallons of L. S. S. and sprayed a portion of the orchard that was infested. The day was very cold and windy, so we could spray only one side of the trees. This was done on November 25th. Upon examination this spring we found no living lice beneath the scale on the side sprayed, but on the opposite side and upon the under side of limbs where the spray did not come in contact with the scale, we found plenty of live lice, thus showing that when the work is rightly done it is immaterial at which season, fall or spring, the spraying is done.

How late can we use L. S. S.? This spring the weather being unfavorable, we did not finish our apple spraying until buds were expanded so far you could see color of petals. This did some damage to buds causing greater part of blossoms to drop, but did no damage to trees.

We sprayed 20 acres of apple orchard between March 25th and April 15th; also sprayed 150 peach trees with the lime, sulphur, salt wash, but as buds were swelling we feared to continue with the peach, thinking it might injure our crop, so we sprayed about 10 acres with Bordeaux Mixture No. 1. This was to prevent leaf curl. The results were surprising. Those trees sprayed with L. S. S. had no curl, while those sprayed with Bordeaux, many were very badly affected and lost greater part of foliage, especially Matthews' Beauty and Elberta, Belle of Georgia, Highly, Kalamazoo and few others were affected to a less extent. As soon as we saw the trouble we again sprayed the entire orchard with Bordeaux mixture, 2-5-50, and checked further trouble and the majority set a very fair crop of fruit, but will need but little trimming as the June drop thinned them about right, but those so badly affected, although they are now re-foliated and making fine growth, have set but little fruit. I feel confident had we sprayed the entire orchard with L. S. S. the trouble would have been avoided and all trees would have had a heavy set of fruit. The third spraying will be given the peach about June 22d, and again about 10 days later, to be followed by more spraying as circumstances seem to demand. These latter sprayings will be to prevent fly-speck, fungus and wilt on the fruit.

To the practical horticulturist, details become monotonous, but I find the average farmer who has done little, if any spraying, wants

details. You would be surprised to see the number of letters I get from farmers and fruit raisers asking questions that have been given time without number; but it goes to show that the average man gives little attention to the detail part until he is ready to make use of it, then finds himself stranded. So I hope I will be pardoned if I go into a few details.

I find that Bordeaux mixture, one of the oldest and most used of all the spraying mixtures, is as little understood as any. One-half who use it do not know if it is to kill scale, codling moth, fungi, or is to fertilize the tree. Not one out of every 10 knows how to properly make it; not one out of 25 knows what it is. The majority think it is a mixture of sulphate of copper, lime and water. We admit that is what you started with, but a chemical change has taken place, and we have sulphate of lime (gypsum) and hydrated copper, two insoluble compounds. So Bordeaux mixture is these two compounds mechanically suspended in water. The sulphate of lime is so heavy, it quickly settles and carries the hydrate of copper with it to the bottom, therefore, it must be kept agitated. Now when this is properly made it will remain suspended three times as long as ordinarily made.

To make Bordeaux mixture requires 3 barrels. In one put 25 gallons water, place 6 pounds sulphate of copper in a sack and suspend it in this, then slack 4 pounds fresh burnt lime in another barrel and add enough water to make 25 gallons, then place a sieve over the third barrel and pour the copper solution and lime through it simultaneously. This makes a Bordeaux mixture that will give best results. This is a fungicide only, but by adding Paris green or arsenite of lead or arsenite of soda it acts as a fungicide and insecticide.

Arsenite of Soda. This is the cheapest insecticide and can be made by the farmer himself. Take 2 pounds white arsenic, 6 pounds sal-soda, boil in 1 gallon of water until dissolved, put in a gallon jug, add enough water to make 2 gallons. One pint of this is equal to 4 ounces of Paris green, and much more reliable as it will remain suspended longer being finer than the Paris green.

Lime, Sulphur, Salt. This is a specific for San José Scale when rightly made and applied. My formula is: 60 pounds lime, 50 pounds sulphur, 25 pounds salt. In a large kettle, put at least 30 gallons water, and while this is coming to a boil, weigh out your ingredients, place the sulphur in a tight barrel, add sufficient boiling water to make it by stirring into a thin slop, then put the lime into the boiling water (about 20 gallons) in the kettle when it commences slaking, immediately creating an intense heat, pour in the sulphate at once and with a stout paddle keep the lime from burning fast to the kettle. This soon settles down to a steady boil, continue stirring

and boiling until you have the chemical change complete. This may take from 30 minutes to one hour. When it has gone through the various changes of color, from yellow to orange, then to dark brick color, it is complete, remove and pour through a sieve into the mixing tub and dilute to make 150 gallons. It then has a greenish yellow color. This should be applied while warm as it works better. Never leave it stand over night or it throws down sliver like crystals, hydrosulphide of lime Ca (S H)_2 , and then the wash has but little value unless the crystals are redissolved by boiling. The value of lime-sulphur-salt is due to two main factors, its causticity, which acts upon the scale as a contact remedy, and its mechanical property acting as a deterrent, preventing the young from attaching themselves.

Lime, Sulphur and Caustic Soda Wash. Lime 100 pounds, sulphur 50 pounds, caustic soda $12\frac{1}{2}$ pounds, water 150 gallons. The lime is put in a tight cask and slaked with hot water, and when giving off considerable heat the sulphur is added; the caustic soda is then added and the whole well stirred, water being added as needed. The mixture is then diluted to make 150 gallons. This has given fair satisfaction, but owing to so much useless lime it is harder to work. When properly made the boiled mixture is the best and cheaper. The new preparation, Kero limoid, is being tried this season, but so far has not given the best satisfaction. If not properly emulsified it has in many instances badly injured the trees. Like all preparations containing oil, it must be used cautiously, as it is not a good material in careless hands. Whale oil soap is a pretty sure remedy if applied while trees are dormant; two pounds to one gallon of water, but it is expensive and destroys many buds. Dust sprays are being used in many sections, but they must be used while dew is on trees. They have not given satisfaction.

Machinery varies according to the demands. For shrubs, bushes and small trees a knapsack sprayer is sufficient; for a few larger trees a bucket pump can be used, but for a small orchard up to 5 acres a good force pump with a large air chamber is needed. Mount this on a barrel or tank and have a good strong man to pump; have a hose not less than 40 feet, a bamboo extension pole with a group of Vermorel nozzles, will give very good satisfaction. But for large orchards you want a power pump. There are many made that are of merit. In 1904 we used gasoline power, having a light, double cylinder upright engine mounted on a low down wagon connected to pump by means of pumping jack. With this machine we could maintain a very good pressure and did good work, but it had many faults. It was heavy and noisy and we had to use a pump and safety valve, and using the lime, sulphur and salt spray under pressure they were always out of order, the wash eating the brass that we

could not maintain equal pressure, so we wanted something better, and hearing of the machine run by liquid gas, doing away with all pumps, I decided to try one, so in fall of 1904 I purchased one, and this seems to fill the bill. We have used it this season on 30 acres of orchard giving three sprayings, and the longer we use it the better we like it. It does away with all the hard, disagreeable work and does away with wear and tear of pumps. Its very simplicity recommends it. It consists of a tank of steel holding from 50 to 200 gallons, with an opening in the dome for putting in the liquid, which is then closed. There is also a gauge to show the pressure, a safety valve set at 125 pounds. This is connected by a strong rubber hose to the liquid gas tube, which is a steel tube containing 50 pounds liquid gas, put in under very heavy pressure, which condenses the carbonic gas into a liquid. When your tank is closed you turn on the gas to any pressure you want. We generally run from 80 to 100 pounds pressure; of course, the higher the pressure and the finer the nozzles the more misty the spray. The hose attachment is in the rear at bottom, and between the tank and hose attachment is a nozzle protector, which prevents any sediment from getting into the nozzles. You can attach one or four lines of hose with four or sixteen nozzles and maintain a steady pressure, doing more and better work than any machine I ever saw. The machine I am using, is the Niagara Gas Sprayer.

The permanent part of my outfit consists of a series of platforms against a side hill. A roadway is graded below the first platform, which is of sufficient height that all material can be run by gravity from the mixing tubs into the spraying machine mounted on the low down wagon. On this first platform is placed two large mixing tubs holding 160 gallons each. These are fitted with $1\frac{1}{2}$ inch gate valves and pipe to convey material to machine. On same level is one large kettle holding 75 gallons, in which we boil our mixture, and another boiler holding 150 gallons, in which we boil water. Above this is another platform on which is a large tank holding several barrels of water. From this, water is conveyed by one-inch hose to kettles, tubs, spraying tank, etc.

BURGESS PENNYPACKER: Dr. Funk, what will destroy the San José Scale?

DR. FUNK: Lime, sulphur and salt is infallible when properly prepared and properly applied.

PROF. SURFACE: When do you make your first application for San José Scale?

DR. FUNK: The first spraying should be while the trees are dor-

mant. The second spraying should be done immediately after the tree blossoms or as soon after as possible. If you spray a few days too soon, while the blossoms are open, you do an injury to a certain extent to the pollenizing of the bloom. Furthermore you poison one of the best friends of pollenization we have, the little honey bee. If you leave it a little bit too long, what do you do? The calyx closes. My friend, Mr. Hall, from Potter county handed me that apple bloom to-day. (Exhibiting one.) You see that is in full bloom. That comes from a little south of latitude 42. We are here in just a little more than latitude 40. I want to show you the difference in regard to the apple. Now what I want to illustrate in spraying is this: The calyx is open and turned downwards. If you spray at this time, a small portion of that poison will get right in that open calyx. Now anywhere in from 8, 10 or 12 days after the petals have dropped, that calyx closes, draws in, just as if my thumb and finger were to close in this manner (illustrating). Now why does that make a difference? The codling moth passes the winter in the pupae stage and at the proper time it will come out and lay its small egg in this apple or on some leaf in close proximity. That little microscopic piece of work is now accomplished and finds a secure hiding place.

BURGESS PENNYPACKER: Does the use of spraying destroy the gypsy moth in Massachusetts?

DR. FUNK: To a certain extent, but they never had sufficient means to carry that out, as I understand it, as they should, but where they used the arsenite of lead, wherever they used it effectually, they kept it in complete subjection in spite of all obstacles, and it is a pest that is if anything rather worse than the San José Scale.

(Holding up a sample of fruit, and naming it the Stamen Wine-sap.) I want to call your attention to this fact. There are gentlemen right in this house that saw these trees on which this fruit was grown, that I am referring to, and last fall a year, they were so completely infested with scale that you could not touch any part of the bark but what you could scrape up the scale. The whole bark was red, and continued red a quarter of an inch into the wood. The heavier limbs last spring were thoroughly sprayed. We thoroughly sprayed these limbs with lime, sulphur and salt and now you can't find a single scale on those trees. We followed up the first application in due time and in about ten or twelve days later we gave it a third spraying, and I propose this summer to carry out an experiment and copper plate them; that is what you may call it, as they do in Oregon, where they get the finest fruit there is in the world. I shall use the following formula: 65 pounds of lime, 50 pounds of sulphur, 25 pounds of salt, and 150 gallons of water.

A Member: Slacked or unslacked lime?

DR. FUNK: You want fresh lime, the very best that you can get. I have here on platform (indicating his method) a place where my wagon comes along, right on this first platform which is level with the ground. I have here a kettle holding 75 gallons. I have another large boiling concern that I can boil 150 gallons or more in. I will fill that 75 gallon kettle very nearly full of water. I weigh out my material and I will put my sulphur in that barrel (indicating) and put sufficient boiling water in it, and stir that up until I get it into a thin slop. I will put about 20 gallons in my boiler and keep that boiling without any check-up, then I will put the whole amount of lime in there, and the moment it is put in there it will start to boiling furiously.

At this time a representative of the street car company of West Chester extended an invitation to the members to visit Mount Bradford, and view the scenes of the Battle of Brandywine.

The CHAIR: How would it suit you, the day after to-morrow at one o'clock—Thursday?

MR. WALTERS: For anything that I know, that would be satisfactory.

MR. STOUT: Let me suggest that we change the hour from one to four, after our adjourning hour, because it will break in on the session here very much if we go at one o'clock.

MR. MARTIN: The suggestion of Mr. Stout is a good one. We will hold our session Thursday afternoon a little earlier in the afternoon, say we begin at one o'clock and then adjourn promptly at four, then we could take the trip which we are so kindly invited to take by Mr. Walters.

On motion, duly seconded, it was agreed that the time be fixed to make the trip above referred to, at four o'clock on Thursday.

PROF. SURFACE: Mr. Chairman, concerning an application for the San José Scale from now until the leaves fall, I will say that the lime, sulphur and salt must be applied when the foliage is off the tree. Now what can we use in the way of a remedy at the present time, before the leaves begin to drop this fall? What can we do? I would advise the use of a thick soap solution, whale oil soap being the best; that will kill it. Any thick solution of soap will do, using two pounds in one gallon of water. While I am speaking of the lime, sulphur and salt wash, I should make a little amendment to what Dr. Funk has given us; that is all right for him, but he is using a spray pump with an immense pressure which is not within the

reach of everybody, consequently you cannot use a solution as thick as he recommends, for you must use a hand pump. A very good and effective formula is, for 150 gallons of water use 25 pounds of lime, 17 pounds of sulphur and 15 pounds of salt. That can be forced through an ordinary hand pump and will answer the purpose, although it is not so strong as he gave.

A Member: That is stronger than his.

PROF. SURFACE: Is it? I do not so understand it. At all events the formula I have given will do the work and can be used with the ordinary sprayer or hand pump.

MR. GLOVER: Dr. Funk, how would you treat apple and pear trees infected with scurfy scale?

DR. FUNK: A few years ago I had a great deal of scurfy scale in my orchard. Since I have been spraying with the lime, sulphur and salt, I have not seen a single tree left infested with the scurfy scale, showing that this wash is just as effectual for the scurfy scale and the oyster shell bark louse, although through the winter there is an egg there instead of a living louse, but I find it destroys them just as effectually as it does the tent caterpillar egg right around the root of a tree.

MR. McGOWAN: Will a continuance of spraying yearly with the Bordeaux mixture have the effect of destroying the San José Scale?

DR. FUNK: It will not.

A Member: I would like to ask the Doctor whether we cannot use something that is more easily prepared than the lime, sulphur and salt for the scurfy scale.

DR. FUNK: My men who help to spray say they would rather prepare a spray composed of lime, sulphur and salt than they would the ordinary Bordeaux mixture, with the conveniences we have. Everything runs by gravity right in our machines.

MR. GLOVER: Will ordinary white-wash kill the scurfy scale?

DR. FUNK: No, so far as actually killing the scale is concerned, it will not do it. I know of instances where trees have been painted, and painted thoroughly with the pure lime wash, but it will not do it.

MR. McGOWAN: How much Paris green shall we use for 45 gallons of water in the Bordeaux mixture?

DR. FUNK: I am not using Paris green alone. I am using one quart of the arsenite of soda, a quarter of a pound of Paris green

to a hundred gallons. If I was using Paris green alone I would use about three-quarters of a pound to a hundred gallons of Bordeaux mixture.

MR. J. W. COX: What is the proper way to prepare the Bordeaux mixture?

DR. FUNK: When I prepare Bordeaux mixture I want to begin ordinarily with three barrels. I want in the one barrel—I am giving it now to make fifty gallons—in one of my outside barrels—I will have three barrels in the lot—in the one outside barrel I will put 25 gallons of water, in the one barrel. It depends of course, upon what mixture you want to make. In the Bordeaux mixture we have Nos. 1, 2 and 3. Suppose you want it, say, for potatoes, in which we use six pounds of sulphate of copper. We put it in a bag so that it is merely covered with water. If you throw it right in the boiler it will form a saturated solution and it will not dissolve for a good many hours; then you will take four pounds of lime and you will slack this with hot water, then run this through a strainer into the other outside barrel and add sufficient water to bring that up to 25 gallons. Now you have got this in the most diluted form that you can get it and then put it through a strainer. I have a strainer made out of four inch white pine and I will put that right over the middle barrel generally, so as to do it conveniently and thoroughly. It is so thoroughly and intimately mixed by this method that you get the very best compound that you can make. You will find by that method of preparation that you will get a very much better mixture than you will get by pouring one right into the other. It is very simple and yet it pays to take that trouble.

A Member: Will that combination do for the apple trees?

DR. FUNK: Well, I will say that I use 5 pounds of lime to 50 gallons.

MR. ESCHBACH: How long will it take San José Scale to kill the apple trees?

DR. FUNK: That depends upon how thick they are on. It is surprising to any one how thick they will cover the tree. You may have a tree entirely free from it this spring, and by this fall you will find it so completely covered that you will find the terminal limbs all beginning to die off and one more season will finish it entirely, right down to the stem.

MR. J. B. JOHNSTON: Is there any successful machine for spraying Bordeaux mixture in dust form?

DR. FUNK: I have had no experience with the dust form of spraying; in fact I do not think that in commercial orchards it will

ever be a successful thing. In the first place, to be beneficial we would have to use it in the morning while the dew is on the tree or you will find it will have but little benefit; but those that are using it, employ different machines, and they claim fair results. I understand that the Illinois Horticultural Society has condemned it as of no account. For myself I can give no personal experience because I have never tried it.

MR. MCGOWAN handed up a twig to Dr. Funk with the inquiry whether it was infested with the scale.

DR. FUNK: (After examining same.) Yes, there are plenty of them there.

MR. MCGOWAN: I have two trees out of five hundred just like that.

MR. DAVIS: Would it be practical for a man to have a machine and go around spraying so as to make it pay?

DR. FUNK: Yes, and no. There are sections where they are doing it and doing it with fair satisfaction. The only trouble is this: The season of the year is comparatively so short, unless a man commences right in the fall of the year as soon as the foliage drops; then I believe it would be practicable. I believe where there are numerous small orchards he could get all the work he would want to do, and I believe that the average farmer would be willing to pay such remunerative prices that it would pay a man to get a suitable outfit and take up the business.

MR. RODGERS: What is the probable cost of spraying orchard trees where the trees are about 25 years old?

DR. FUNK: It will cost you about fifteen cents a tree. It depends upon the planting of your orchard. If you have got it about 30 by 30 you would have there about \$7.50.

A Member: For each spraying?

DR. FUNK: No, that would give you three sprays.

MR. ESCHBACH: What would you use for the currant worm?

DR. FUNK: There is nothing better than to dust them with the white hellebore, although when we are spraying our orchard, I have a row of currant bushes, and I put the Bordeaux mixture right over them and it thoroughly cleans them out. When the currants are grown up you won't find anything on them. I generally use the white hellebore. It takes but a very little bit.

COL. DEMMING: There are several present who have been members of this Board, connected with it in some capacity since its organization, nearly thirty years ago. They will agree

with me, I think, that this has been the most complete and satisfactory statement in regard to spraying that we have ever had since the existence of this Board and it would well pay the State of Pennsylvania to have what has been said here to-night printed in pamphlet form and sent to every farmer in the State.

MR. MARTIN: While we altogether agree with this suggestion, I may say that it is the intention to have the proceedings of this meeting published in bulletin or pamphlet form, in such numbers as to make them available to the farmers of the State who desire to use them.

After announcement by the Chair as to to-morrow's program and an earnest request that all be present to get the benefit of the meeting, the Institute adjourned until to-morrow morning at nine o'clock.

Memorial Hall, West Chester, Pa.,
Wednesday, 9 A. M., May 24, 1905.

Second Vice President, S. S. Blyholder in the Chair.

DEPUTY SECRETARY MARTIN: My friends, we have a bright day and the prospect of a very busy day before us. Before we enter upon the program proper, we deem it best at this time to appoint a committee on resolutions, and we will name as that committee, the Hon. Wm. Brosius, of Lancaster county, Mr. D. A. Knuppenburg, of Wyoming county, and Mr. L. W. Lighty, of Adams county, to serve as a committee on resolutions.

Our Institute is especially favored at this session by the presence of a number of visitors from other states and organizations. We see with us this morning Dr. Franklin Dye, of New Jersey, Secretary of the Board of Agriculture and in charge of the Farmers' Institute of that neighboring state. I know you will all be pleased to meet Mr. Dye this morning if he will just come forward and make a few remarks for our benefit.

ADDRESS.

BY HON. FRANKLIN DYE. *Secretary, Board of Agriculture, N. J.*

Mr. Chairman, Ladies and Gentlemen: As the young lady said, this is altogether unexpected, and I do not think, Mr. Chairman, that it is the best thing, because, as you have just intimated, you have a very busy day before you and a large program

to work off. I am not an official doctor in any form by name, nor professor, I am simply Franklin Dye. I am glad to be with you, my friends. I was here last evening and could have said something then perhaps more appropriately than now.

You will recall the expression of one of the speakers who made an address last evening and touched somewhat upon matters political. I am so glad there are indications of an arising light in Philadelphia and Pennsylvania, the light of purification. We set you an example in that direction several years ago in New Jersey when we had to rid ourselves of the race-track business. We are trying to behave ourselves over there now.

I endorse the sentiment that the farmers are the foundation of national stability as well as of wealth, and I think, my friends, there is nothing egotistical in saying that. We can admit that fact as farmers, and admit it seriously and feel that upon us is laid a very great obligation. We represent more property, more wealth than any other class in the country. Its running capacity is greater, so great indeed, that we can run a Presidential election without regard to Wall Street, and the farmers, if they are prosperous, if they are doing well, can control matters with perfect safety. We want to keep our farmers right, morally, intellectually, if you please, right on these great questions, so that when they are sprung upon us, particularly in the cities that are dangerous to Republican and Democratic government, we shall have this great body of farmers throughout the country and if we have them right and united, our old Government will forge on for centuries to come. So, my friends, let us try, not only to be right, as we are advancing in agricultural work, as we are all trying to do, but let us try to be united more than we are. I think we do well to emphasize that point. Let us through our several states and counties and several cities endeavor to have the farmers united, because if they are not united we never will accomplish what we want to do for ourselves and for others.

I hope to enjoy your program, and was glad to meet so many of my fellow-workers here. I wish you every success, and hope that the good things will radiate over the river into New Jersey as well as westward into Ohio.

DEPUTY SECRETARY MARTIN: The Division of Farmers' Institutes in Pennsylvania has always recognized and appreciated the help and strength given agriculture by the agricultural press of the nation. We have with us this morning a representative of one of the strongest agricultural papers in the land, *The American Agriculturist*, Prof. Wm. J. Johnson, of New York. I know you will appreciate listening to Prof. Johnson for a moment.

• ADDRESS.

BY PROF. WM. J. JOHNSON, *Editor, The American Agriculturist.*

Mr. Chairman, Ladies and Gentlemen: When I came in the door your worthy Chairman asked me if I would make a few remarks. As you all know, I am always ready to respond to such an invitation. If Mrs. Johnson were here, she would probably tell you that I am not only ready to make a few remarks, but usually desirous of having the last word. I am sure it will not be the case here. What I have to say will be very brief indeed. I wish to extend to you a hearty greeting as a representative of the agricultural press; hearty sympathy with you in the work in which you are engaged. It makes little or no difference where you find us working. We, as your worthy Secretary has said, are united in this one proposition, that the one great movement in this country to-day, so far as the farmer is concerned, is one of education.

I have come to believe since I left the old Ohio farm, about twenty years ago, that we are now just beginning an era when the education of the American farmer will see more progress during the next ten years, than it has in the last fifty. That may seem a very strong statement, but I believe it is true. I mean by this just such work as is being done here in this State and in the various other states, through the selection of the very best and most practical men, who have been working and solving these problems on the various farms and are coming together annually and discussing their success; in this way becoming farm missionaries, practically reaching out into the field and giving their brother farmers and co-workers a helping hand where they need it.

As I have mentioned before, you have one of the most concrete examples in this State that we have in America to-day in the great work that has been accomplished by your fellow-worker, Mr. Detrich. I am glad since I came in this hall that we are to be given an opportunity of going this afternoon to the place and there seeing for ourselves the farm of 340 acres, which in less than a year has been converted from a worn out and abandoned farm with all the elements that went to make up the success of successful crop culture, worn out by mismanagement, but now set upon a practical, definite basis from a business point of view. This is simply the application of the principles inculcated in this Institute, an application of missionary work, by the missionaries who are reaching out and helping those who need help more than any other class in this country.

Of the 29,000,000 wage earners in this country, more than one-third are directly engaged in agricultural pursuits; in other words

over 11,000,000 of wage earners in this country are engaged in agriculture and agricultural pursuits. That means that we have this great mass and great class of people who, as our friend Mr. Dye says, represent the very foundation of all our success and material wealth. This class of people are now beginning to be reached, as it were, by the Farmers' Institute Department; by the College Experiment Station; by the Grange, and by the work done by the Department of Agriculture of the National Government; and better and still better, I may say, that the individual in his home is becoming a teacher of principles. He is beginning to look deeper and deeper into these problems. He is beginning to unravel these intricate matters in his own home circle.

It was my pleasure recently to spend an evening with one of your most successful farmers in this State, and the whole drift of the conversation that evening was upon problems that confront the individual on his farm, and how he has successfully worked them out and succeeded. And I want to say to you that the youngsters in that family were as much interested as could possibly have been a miscellaneous outside audience, because these young men and young women in that family and by that fireside, realize as they never realized before, that the tendency of the times is back to the land; and when you get into great congested cities like Philadelphia and New York, we find that the people in some of the sweat-shop districts are beginning to ask and want a home in the country. This is largely due to the fact that the telephone is connected with the home—has connected their business interests with the home in the country to such an extent that the busy man in Wall Street or the busy agricultural editor can live in the country and still conduct his business by keeping his finger on every detail of his business, although he may live miles away, which has been made possible through the electric trolley, a condition which ten or fifteen years ago was practically impossible, and a man can live in a little hamlet or village now at five, ten, fifteen or even thirty miles distant from his business, and still go backward and forward to his office. The tendency is back to the land, and it behooves us as interested in all these movements to build up and lift ourselves higher in the scale than we have ever been before. From what I have said, my friends, you will see that the attention of the people in the cities has been turned away from those specific lines of work in which they have been engaged, back to the country; hence I say that I believe within the next ten years we shall see a greater advance along these lines than we have ever seen before.

I want to leave one word with you and that is this: This is primarily a day of observation. There is a great difference between

observation and imagination. A little story will illustrate this: While traveling in the South I came across an old colored man who was said to have been the best shot in that whole county, and the old man prided himself on the fact that he never failed when he pulled a trigger on a 'possum; he always brought him down. As the story goes, he started out one afternoon on a 'possum hunt with one Bill Jones and they came up to a very large tree in an open field and out on a limb ten or twelve feet from the ground, the old colored man saw, or imagined he saw one of the largest and fattest 'possums he had seen in all his life. Drawing up his rifle he pulled the trigger but no 'possum came down. Now Sam's friend, Jones, grew rather suspicious. He looked at the tree carefully but could not see any signs of a 'possum, and he turned around to the old colored man and said, "Sam, I tell you there is no 'possum in that tree." "O," said Sam, "my eyes never failed me. I've killed nigh onto three hundred 'possums in my day, and I'm going to try it once more." So the old gentleman loaded up again, raised his rifle, pulled the trigger again but no 'possum came down. Then his friend Jones walked around a while, looked at the tree and thought there must be something wrong with the upper part of old Sam's head, and he looked him over carefully and away out on the end of his eyebrow there was a louse, a product of his own head, a concrete example of imagination. On the other hand, in the case of Jones we have one of the best examples of observation that I could possibly state. Jones was an observing man, knowing there was no 'possum in that tree, his object was to discover what Sam had seen which he imagined to be a 'possum.

DEPUTY SECRETARY MARTIN. Old Sam represents the old farmer then.

PROF. JOHNSON: So be careful when you load your gun and be sure that your game is always in sight and don't let the other fellow deceive you.

MR. MARTIN: As I cast my eye over this audience I see over here on the left a representative, in a certain way, of Pennsylvania's favorite agricultural paper entitled, *The National Stockman and Farmer*, Mr. Alva Agee. He needs no introduction in Pennsylvania. He is well known in the farmer's family in this State. Will Mr. Agee please come forward and make some remarks.

MR. AGEE: Mr. Chairman, I do not feel that I am a stranger in this meeting. I recall the fact that ten or twelve years have passed since I first met very many of you in this room. I thought that last night as I passed in the rear of the audience and noted your

appearance that I could discover that the marks of time began to show and yet after all, I see very little change. I am glad, friends, and I congratulate Pennsylvania, that we have a Director of Institutes here who stands in the front rank of institute directors for providing a meeting of this sort, in giving to us a Normal Institute that will prepare us for the work that we have to do. Only recently have I realized fully that the science of agriculture is a new thing; that within the last twenty-five years there has grown up what may be truly regarded as a science connected with the art of agriculture, and I am delighted that I am living and that we are living in that day when you and I have the privilege of helping to carry to our co-workers on the farm these new facts. The work of an institute director, the work of an institute lecturer I mean, is made better through these normal meetings; and the work of the agricultural press of to-day has greater influence than it will have at any future time in scientific agriculture because we are teaching men who can heartily appreciate it that there is a science of agriculture that is of the greatest importance to us. Why, thirty-five years ago this State had not got to work; these facts had not been developed, and now we stand in a way, if we can assume to say it, we stand in a way between the ultra-scientist, the man in his laboratory, and that one who has not the time that we are taking for the study of the results of science. It is our business to study these results and see where they apply to our field; how the man who must have a dollar in this world for the education of his child can take hold of these new facts that the scientist works out and convert them into that dollar. And do you know, I would not exchange the opportunities that you and I have to-day in the translation of these scientific facts, into the terms of the farmer, who has not had the opportunity to study, I would not exchange the opportunities for usefulness that you have, gentlemen, and that I have to-day, for the work of any other man on the face of the earth, unless it be the work of the farmer himself. It is not a matter of popularizing agricultural education, nor is it a matter of popularizing science; I do not care for those things specially. It is for the results that we are going to get in better country life, better rural life and by helping the man who is endeavoring to-day to secure another dollar that he can expend usefully and helpfully for his children and for his family.

Now that is where we believe there is another reason to congratulate Pennsylvania, that there is a Director of Institutes here who brings together in these normal meetings working associates from the State College, from the Department of Agriculture at Washington, who meet with us and impart their knowledge so that we can think over it and study it, and weigh it and then carry it back to the men who will make the institute audiences the coming winter.

I thank you for your attention and the privilege of saying these few words to you. If I have just one criticism of our Director, it is that he should have called upon me at all and that he said that I am an outsider, because I like to think that I am a Pennsylvanian and you can't get rid of me that way. A gentleman in Ohio lost his wife a few months ago and he met a friend in Pittsburg on the street, and he said to his friend that it was hard for one to lose his wife. The Pittsburger said, "Yes, it is; it is almost impossible."

The CHAIR: We will now proceed with our regular program. The first number on the program is, "Soil Bacteria and Cultures—Their Relation to Leguminous Plants," by Prof. T. R. Robinson of the Bureau of Plant Industry, Department of Agriculture, Washington, D. C.

SOIL BACTERIA AND CULTURES—THEIR RELATION TO LEGUMINOUS PLANTS.

BY PROF. T. R. ROBINSON, *Bureau of Plant Industry, Department of Agriculture, Washington, D. C.*

The topic assigned me to discuss, "Soil Bacteria and Cultures," though comparatively new, has doubtless come to your attention through the press and magazine articles, numerous times within the past year. It is a subject which offers wide opportunities for startling write-ups and rosy predictions; moreover, the whole subject of bacteria is such a hazy conception in the layman's mind that it is doubly easy to obtain an erroneous idea of the proper usefulness of soil inoculating cultures. To begin with, let it be understood that soil inoculation is not a process "to get something for nothing." It is no scheme for "perpetual motion" in crop-production; it contemplates no real revolution in agricultural methods and ideas.

The bacteria we are to consider are really but a small part of the *soil bacteria*, namely, the group which nature has adapted to infect the roots of leguminous or "pod-forming" plants, thereby forming protuberances called "nodules" or "nitrogen-knots." This latter name is derived from their well recognized ability to supply the plant with nitrogen derived from the air and it is this power which accounts for the fact that soil which bears a clover crop is actually enriched for the succeeding crop. This fact has been utilized to advantage since the earliest days of agriculture by including in the crop rotation some of the pea-like plants for adding nitrogen to the soil.

It is only in comparatively recent years, however, that the precise reason for this soil improving power of the legumes has been established. The demonstration by experiment that legumes could be made to grow normally in soils entirely lacking in nitrogen, provided the nodule-forming bacteria were present, proved beyond doubt their nitrogen-fixing power, and gave a sufficient reason for a further study of these organisms. The importance of soil nitrogen need not be urged in addressing such a body as this. As Prof. Bailey recently said: "The quest of nitrogen has enlisted not only many of the wisest men, but it has absorbed the attention of even the major part of mankind; for, by far the greater number of men have lived on the bounty of the soil and their accustomed work has been an effort to maintain that bounty."

Now the question may arise, "If these beneficial bacteria are already in the soil, why need we concern ourselves about them?" Doubtless in many cultivated soils there is no need to take them into consideration, except as we utilize them by occasionally sowing legumes. But, unfortunately, there are many soils which are not naturally stocked with these bacteria. The attempt to grow legumes in such soils results in one of three things:

- (1) The crop sown either fails absolutely, or it
- (2) Makes a scanty growth the first year and only after repeated sowings becomes established, or it
- (3) Grows (in fairly rich soil) without the aid of the bacteria (that is, having no nodules) drawing its nitrogen entirely from the soil and thus its benefit to the soil is no greater than a cereal or other non-leguminous crop used as a green manure.

No doubt you are all familiar with the second phase; the final establishment of such a crop as clover, alfalfa, or soy beans only after repeated sowing on the same soil. This is due in part to the bacteria carried into the soil with seed and chaff, and in part, no doubt, to the gradual adaptation of other bacteria previously associated with some native plant of the pea or clover family. If the figures could be gathered representing the annual loss of seed and labor involved in attempting to establish legumes on soils new to the plants, the aggregate, I am sure, would convince the most skeptical of the economy and, in many cases, the absolute necessity of introducing the bacteria by some form of artificial inoculation. The method which most readily suggests itself is the transfer of soil from an old field. This method, while it has often given most satisfactory results, is still open to objection. The use of soil of unknown origin for this purpose is liable to carry into new localities plant diseases the damage from which would be greater than any possible benefits obtained from the soil inoculation. Among the diseases which might readily be carried in this way are the bacterial diseases of the

potato, tomato and egg plant, the wilt disease of cowpeas, melons and cotton, and various root-rot and nematoid diseases widely distributed in the South. No careful fruit grower would dare use soil in his orchards without first ascertaining that it had been taken from a locality free from root-rot and crown gall diseases.

The liability of spreading weed seeds and insect pests is of scarcely less importance, so that in every case, soil used for this purpose should come from a source which is definitely known and is safe to use. This is a difficult matter to determine in many cases, so that, under average conditions, the method of soil transfer is open to suspicion if not positive objection.

To obviate such difficulties as these the attempt was made to cultivate the bacteria in pure cultures and thus introduce them into the soil. You are doubtless familiar with the failure of early attempts along this line—the German product “Nitragin” proved unsuccessful in practice, owing, as was afterward demonstrated, to faulty methods of cultivation and distribution. The rich nitrogenous medium used gave a luxuriant growth of the bacteria but the conditions of life were so easy that the organisms deteriorated in vigor and failed in their essential part as “nitrogen-fixers” when again released in the soil.

When the problem was taken up in the Laboratory of Plant Physiology, at Washington, a different principle was adopted; the bacteria were given a food supply practically devoid of nitrogen and only those organisms which were vigorous and able to utilize nitrogen direct from the air could survive such conditions. In this way a strain of bacteria was developed which was, so to speak, “nitrogen-hungry,” and when again released in the soil they showed the result of this forced activity in using atmospheric nitrogen. This result was not arrived at in a single test nor even in a single season. Continuous work was done in laboratory, greenhouses and at the Government Experimental Farm at Arlington for three years. In one season, something over 10,000 separate inoculation experiments were conducted on small plots at the Experimental Farm, and the practical side of the question was continually kept in view.

It was not considered sufficient that the bacteria should merely be grown without deterioration: the constant aim was to increase by artificial methods of cultivation their usefulness as “nitrogen-fixers” and to adapt the cultures to actual use under field conditions. You are all familiar with the marvels which horticulturists have produced by scientific plant-breeding and selection. Who can say that *similar* results, at least, are not possible in dealing with microscopic plants—for instance, the nodule bacteria of legumes? As a matter of fact, the methods of growth previously outlined have been shown

by actual tests in the laboratory to produce bacteria of higher efficiency in gathering nitrogen than the forms grown without regard to the laws of plant breeding and selection, and their effect when introduced in the soil has in many cases verified the belief that these highly-bred forms are actually given an advantage over the wild forms existing in many soils.

It was not only necessary to properly grow the bacteria but they must be distributed in a form which the farmer could handle for himself. Hence, resulted the "dry culture." By growing the bacteria first in a liquid culture, soaking this up with absorbent cotton and drying the cotton, it was found that bits of this dried cotton would serve as "starters" for new cultures. The bacteria on the cotton had only to be immersed in water and supplied with a few simple nutrient salts in the solution to resume their interrupted growth and thus soon fill the water with active bacteria. By sprinkling this liquid culture upon the seeds to be sown, the bacteria may be carried into the soil and assist the plants in securing their nitrogen supply; or, if the liquid be mixed with clean soil and this inoculated soil spread over the prepared ground previous to seeding the same result would be obtained. This method seemed sufficiently simple to be handled by any person of average intelligence, and accordingly plans were perfected by the spring of 1904 to test the method on a large scale. During last spring, summer and fall about 12,500 packages were sent out, reaching farmers in nearly every state and territory and supplying cultures for tests with all the common legumes. The whole success or failure of the method, of course, depended upon what could be accomplished *by the farmer, on the farm, or the gardener, in his garden*, with no assistance other than printed directions, and *usually* without comprehending, except in a very vague way, the reasons for the various operations necessary. If the tests had been carried on by carefully selecting the experimenters, supplying the cultures only to trained bacteriologists, botanists, and men of similar professions, the results might have been in some ways more uniform. This course would not, however, have solved the practical problem, namely, the adaptability of the culture method to general use; therefore, no discrimination of any sort was practiced, all applicants for cultures being treated alike. The results obtained have already been made public in two bulletins issued by the Department of Agriculture (Bulletin No. 71 of the Bureau of Plant Industry, and Farmers' Bulletin No. 214) and show that, under the proper conditions, the use of cultures is decidedly profitable and that the dry culture method is eminently practicable under average farm conditions. Very recently a supplementary bulletin has been issued (Part IV of Bulletin No. 72, Bureau of Plant Industry) giving in con-

densed form specific information as to where the use of cultures may be profitable, and where they are of no benefit; also furnishing directions for making up large amounts of culture material for field use from the pure culture "starter."

Eighty per cent. of the reports which were of such a character that a direct comparison could be made showed a gain from inoculation, and reports are constantly coming in which at least maintain this average. Of course, there were many failures from definitely stated causes such as drought, flood, poor seed, weeds, improper cultivation, etc., which are not reckoned in the percentage given and it must be recognized that *there is no "magic" in the cultures* to overcome failures resulting from such causes. Neither do the bacteria supply all the conditions for growth; they are active only in storing up nitrogen, and where soil is so deficient in potash and phosphorus as to require these elements inoculation will *not* act as a substitute. The need for lime upon acid soils is another factor of great importance. The legumes generally prefer a soil rich in lime and a partial explanation for this lies in the fact that the bacteria can not properly perform their work in an acid soil; they either fail to produce nodules, or the nitrogen fixation is greatly reduced.

The question now arises, "What *are* the proper conditions" under which it may be advantageous to inoculate seed or soil?

This will depend largely upon previous experience in growing legumes on the same soil. If no difficulty has been experienced in getting a stand, and the crop has been up to the average it is usually safe to assume that the soil is already adequately supplied with the bacteria and requires no inoculation. In the future it will be well, however, by examination of the roots to make sure of the presence of nodules on all legumes grown. Without the nodules the legumes will deplete the soil like any other crop, and with the nodules the growth is almost always more satisfactory and economical. In soil already rich in nitrogen, inoculation will not often pay, as the plants will draw from this direct source instead of from the air; moreover, the presence of considerable nitrogenous material in the soil acts as a check upon the bacteria in their normal function of forming nodules and fixing nitrogen. Their apparent refusal to add further amounts of nitrogen to a soil already rich may be regarded as a kind of poetic justice; so that in this case, at least, the scriptural rule, "To him that hath shall be given," does not seem to apply.

It is, therefore, pre-eminently for *poor soils* (low in organic matter that is, nitrogen) that inoculation offers the greatest possibilities—the type of soil, in fact, which is most benefited by leguminous green

manures. The fact that legumes do not thrive is not in itself an indication that the bacteria are lacking, there are, of course, other soil conditions to be considered. An examination of the roots as to the presence or absence of nodules is the first and simplest criterion, but, lacking this information, nothing short of an experiment in inoculation will disprove the assumption that the lack of bacteria is responsible for failure. Moreover, the finding of a few nodules and these only on scattered plants, indicates that the soil is inadequately supplied with bacteria and their wider diffusion by means of cultures is often of distinct advantage.

Finally, if the cultures used contain organisms of the highest type, some advantages will often be found from inoculation even in soils where legumes have previously made a fair growth, but not satisfactory in all respects.

Perhaps the most important application of cultures is in connection with sowing legumes, such as alfalfa, in regions where they are entirely new. The bacteria adapted to infect the ordinary cultivated clovers and which are quite widely distributed do not produce nodules on alfalfa, nor do the organisms of our common peas and beans readily take to the soy bean and cowpea. In sowing alfalfa, for instance, in new soil inoculation where other conditions are favorable, will usually make the difference between success and absolute failure, a difference not to be reckoned in percentages.

To illustrate the points which I have attempted to present in the foregoing discussion, it may be well to cite a few concrete examples such as are afforded by the reports received from farmers who were furnished with cultures for experimenting. These reports fall under several classes according to the conditions under which the experiments were carried on. The first class includes those cases where the effect of inoculation was brought out in a striking manner owing to the entire absence of the bacteria in the soil previous to using cultures. A few reports only can be cited and in most cases those selected have been recently received, thus furnishing evidence not only as to the stand secured but also as to the ability of the plants inoculated to go through the winter. The importance of selecting reports of this kind may be seen from the following, from South Haven, Michigan:

"Last year I tried a culture of nitrogen-fixing organisms for alfalfa. I reported failure, but this year the difference between the inoculated and uninoculated plots can be plainly seen. The plants inoculated are at least twice as large and much darker in color. I received the inoculation outfit when the plants were about two inches high and sprinkled a small plot in the field with the culture solution. On account of weeds we had to clip real often last year and so we could not see the difference."

Also a report from Allentown, New Jersey: -

"Good growth last fall, went through the winter fine, coming on fast now. Planted alfalfa on same ground before without treating seed and it proved a failure, but this is a great success."

From New London, Ohio:

"Plot sown without inoculation came up good, but did not winter. Plot inoculated wintered and will harvest a fine crop of hay. Sown on clay loam tiled."

From Gretna, Louisiana:

"Of the 100 pounds of seed about two-thirds was inoculated (it being all the bacteria would admit of), and this amount was planted to six acres on December 1 and 2. The remainder of seed not inoculated was seeded to remaining four of ten-acre plot. That inoculated grew thick and at this date (April 28, 1905,) is 19 to 24 inches high, balance thin and not more than from 6 to 10 inches."

From Doe Run, Pennsylvania:

"My alfalfa has a very fine set at present. This is my third attempt, but the first inoculation. The other two were failures. The tops are already (May 1, 1905,) eight inches high and roots twelve inches deep." (Sown last August.)

From Woodbine, Pennsylvania:

"Result of inoculation very gratifying. At this date (May 3, 1905,) the plants average fully ten inches in height and stand very thick and of good color. The plants from inoculated seed are fully seventy-five per cent. larger than from untreated seed."

From Decatur, Georgia:

"I desire to say that I have had very interesting results here in Georgia with a test of inoculating material on alfalfa. My strip of uninoculated alfalfa that had a good supply of both lime and phosphoric acid is now very yellow and will almost certainly die. All strips of inoculated alfalfa are dark green, but the strip supplied with lime and phosphoric acid has made the best growth. It is now (April 9, 1905,) two feet and six inches high, and will do to cut May 1."

(Specimens received April 22 showed splendid nodules on inoculated plants; none on others; gain by weight 400 per cent.)

From Mount Vernon, New York:

"Last July I planted 38 pounds good seed after treating as directed. Part of the ground I tried alfalfa on before without inoculating, which grew a little, then faded away to nothing, but this seeding grew from the start and had a nice top when snow covered it last December. This spring it has started up fine and is growing rapidly, and is bound to be a success, all owing to the seed being inoculated, I firmly believe. A neighbor just over the fence in an adjoining field sowed two acres at same time I did, without inoculation, and his is a total failure."

From Sidney, Ohio:

"Perceptible nodules were formed on the red clover plants; both root and top development was much greater than that produced from non-inoculated seed and the latter produced no nodules. Soil a worn-out clay."

Similar results might be cited for other legumes, such as cowpeas, soy beans, garden peas and beans, but as these crops were harvested last season the reports were sent in last fall and many of them have already appeared in print. Two cases, however, may be given as illustrating the result of growing properly inoculated legumes to enrich the soil for succeeding crops. Last fall a report came in from Cresson, Pennsylvania:

"On the ground which never before would raise a crop of beans, we had a marvelous crop this year, the heaviest ever seen in this locality. Planted seven rows in middle of field without inoculating, and the old conditions prevailed."

Just one week ago, the same grower reported that rye sown in the fall was showing the effect of the bean crop in a remarkable manner. He says:

"In regard to the strip where the beans were grown without inoculating, there is a marked difference, not so much in the height of the rye as in the color and thickness of the growth. The color on this strip being a light or yellowish green, with a light stand on the ground, while the part where the beans were inoculated, the growth is dense, fully fifty per cent. more rye growing on the ground and the color being of the darkest green. The inoculated strip is very noticeable to the eye, the outlines being sharply defined. The difference in height is about 5 or 6 inches."

A personal visit to this place, fully confirmed the owner's observations.

From Macon, Georgia:

"You sent me some soy bean cultures last summer which I never reported on. The crop was nearly half ruined by the awful drought we had, but the point I wish to call your attention to is that I planted the whole field where these beans were in fall oats. The crop where the beans were planted are at least one-third higher than the others and much fuller headed and tillered out much more, and are so green that they are almost black."

Now, taking another class of reports, those showing the effect of inoculation in soils where the same legume is commonly grown and fairly satisfactory. From Los Angeles, California:

"The 40 acres (in the Imperial country) which I had planted with alfalfa seed inoculated according to your directions has a fine stand of alfalfa 4 to 8 inches high in 10 weeks, and winter at that (February 6, 1905). It is almost a perfect stand. On 25 acres right along side of this I only got about three-fourths of a stand, and it was planted at the same time in the fall."

From Fort Worth, Texas:

"Sowed 1,000 pounds of seed on 50 acres. Obtained one-third more alfalfa hay where inoculated; three-fourths ton per acre first cutting, one ton each from the other two cuttings."

In clover regions, too, results fully as striking have come to our attention. From Lenox, Massachusetts:

"A year ago you very kindly sent me a package of inoculating material for red clover. I followed directions and planted the seed upon a plot of land on my farm in Lenox, Mass., that had not been fertilized during 16 years. A litmus test showed acidity which was corrected with 'lime ashes.' Upon adjoining field also limed, but sown with untreated red clover, I obtained a very poor showing, while upon the field sown with red clover inoculated with your bacteria I got a splendid growth."

From Mortimer, Kentucky:

"Last spring you sent us enough bacteria to inoculate about a bushel of clover seed, and we have gotten fine results from it; the only clover that lived out of 75 acres."

From Hopkinsville, Kentucky:

"I cut two acres of clover which had been inoculated and two which had not been, and find that there is a difference of about 500 pounds per acre in favor of inoculated seed."

From Flat Ridge, Virginia:

"The clover is two or three times larger than portion of field not treated. You can tell where inoculated as far as you can see the field."

I might add that I personally inspected this particular clover field and found the report literally true. A distinct line, visible a half-mile off, marked where the inoculated seed had been used, although it was sown on the upper parts of the field, more exposed to the effects of washing and drought. The region is one where clover is regularly used in rotation though it has not always yielded satisfactorily.

One report from a typical cowpea region in Georgia indicates a parallel advantage from inoculation:

"The growth has been rank, of rich dark color over the entire field that was seeded. A difference in favor of the inoculated pea was quite noticeable. My neighbors and friends who have seen the field insist that the field is seeded with a different kind of pea. I wish to express to you my satisfaction and gratification with the experiment. I believe the work you are doing is of inestimable value to the farmers of our country in the future redemption and improvement of our lands."

This plantation was also visited by me at the time of harvest and the inoculated piece of 10 acres yielded one-half ton per acre more peavine hay than 40 acres sown without treatment—this, notwithstanding the fact that the 10 acre piece was seeded two weeks later and was regarded by the owner as a poorer piece of ground. Nodules were present on both fields, showing no striking lack of the bacteria in the soil.

A few cases of special interest may be referred to in passing:

For instance, the effect of inoculation on a growing crop; of course, the usual application is preliminary to seeding. From East Bend, North Carolina, a recent report shows what may be done in this way:

"Last summer you sent me two packets of alfalfa bacteria which I carefully applied according to directions. With one packet I top dressed a lot which had been mown three times. The crop was light and looked yellow. I harrowed in the inoculated soil and soon noticed that the growing crop had turned to a healthy green and our next mow was the heaviest we had. I am much impressed with its value."

The duration of the effect of inoculation is also a matter of some importance. It is generally conceded that the bacteria will live over in the soil from season to season, unless too long a time elapses between sowing the same legume, that is, within three to six years. This is illustrated in the following report from Gillham, Arkansas:

"Two years ago I received a package of inoculating material from you for alfalfa, and a year ago I reported my alfalfa a failure because of weeds, although the inoculation took. I plowed up the ground and planted it in Kaffir corn and raised a better crop than I expected. This year or spring I sowed it again to alfalfa and the nodules cover the roots of this new sowing. It was two years ago that I inoculated the ground by mixing the culture with soil and harrowing in it. I used about two buckets of bacteria inoculated soil to the acre and sowed it broadcast."

Somewhat similar results are reported from Knoxville, Tennessee:

"In the fall of 1903, you were kind enough to send me enough of bacteria culture to inoculate one acre for alfalfa. I applied it on one acre after manuring the land with stable manure, and sowed the alfalfa. At the same time I inoculated twelve acres with soil obtained from an old alfalfa field. This twelve acres was also treated with stable manure before inoculation and before seeding."

The alfalfa came up beautifully but during the very cold open winter which followed, both fields froze out.

"I plowed up the twelve acres in the spring and again inoculated it with soil and manured it. Again, I obtained a perfect stand on the twelve acres, but the alfalfa plants did not seem to grow any after the last cutting and it froze out in patches, though some of it is excellent.

"Now for the one-acre field. In August last I plowed it and sowed it in alfalfa, *without re-inoculating it*. It came up at once and was 8 to 10 inches high when the winter closed in. This piece *did not* freeze out, but started early in the spring and has grown riotously ever since. We have been cutting it for two weeks and feeding it green to thirty-five dairy cows, and have not yet cut half of it. The new growth started at once and will be ready to cut again by the time we need it.

"The purpose of this report is to call your attention to what seemed to me to be a fact, viz: That the bacteria in the cultures are more active and more alive than in the inoculating soil. This may be due to loss in drying and transporting the soil, which was brought about 500 miles by rail."

The testimony here presented in regard to the use of soil in comparison with cultures receives some support from an account recently received from Illinois:

"Last year you sent me for my farm in Cook county, Ill., some inoculating material for alfalfa. I also received some inoculated soil from the University of Illinois. I planted about four acres. (We sowed broadcast.) Plot No. 1.

One acre was inoculated with soil, thereupon plowed, etc., etc. Plot No. 2. Two acres were inoculated with soil and thereupon disced and harrowed, etc., etc. Plot No. 3. One acre was treated with your material and thereupon harrowed lightly, etc. Plot No. 3 shows wonderfully fine this spring. Plot No. 1 shows next best (very fine), and Plot No. 2 shows also very good, although not as fine as the other two."

In garden use the inoculation of peas and beans, by insuring an adequate nitrogen supply, seems in some cases to hasten maturity, a matter of importance to many growers. From Janesville, Wisconsin:

"Plants were stronger, blossomed two weeks earlier, stood dry weather better, and matured more peas than plants not so treated. In addition, I inoculated seed for four other parties, requesting them to report to me. One man reports 50 per cent. better yield. His soil was poor, and the bacteria showed more effectively by contrast. A market gardener reports a larger yield than from similar seed not treated, but to him the best feature was earlier maturity by two weeks. All report favorably, those planting on poor soil reporting the largest increase."

The use of seed already inoculated will no doubt save much time and trouble when persons are sowing small quantities of seed. All leguminous forage seed, sent out by the Department of Agriculture is previously inoculated, and the effect is evident, in many cases. In a recent bulletin from the Maine Station mention is made of sowing some treated alfalfa seed:

"The seed was specially procured from the United States Department of Agriculture, and had been inoculated with alfalfa bacteria. Root tubercles have developed abundantly on all the plots."

A representative of the Department who visited these plots further demonstrated the fact that alfalfa sown in the vicinity without inoculation was barren of nodules and failing. It will probably not be long before "inoculated seed" will be a regular item of trade and, with proper precautions, there is no reason why seed so treated should not give a good inoculation, that is, if used within two or three months after treatment.

In regard to the proper method of handling soil-inoculating cultures very little need be said; the directions are quite simple. The dried cotton culture is usually wrapped in tinfoil and, after opening, is placed in a solution formed by adding the contents of package "No 1" to a definite quantity of clean water. This solution contains one per cent. of sugar 1-10 per cent. of potassium phosphate, and 1-100 per cent. of magnesium sulphate. These salts with the sugar as a source of energy, favor the growth of the nitrogen-fixing bacteria held dormant in the cotton but do not offer a good medium for the growth of yeasts and molds carried about in the air and which are bound to contaminate the culture in a greater or less degree. This contamination should be reduced as much as possible by previously boiling the water and allowing it to cool, at least until lukewarm.

scalding out the bucket or tub, and keeping the liquid covered at all times. The temperature maintained should be that of an ordinary living room; about 70 degrees Fahrenheit. After twenty-four hours' growth in this solution, another package is added, containing ammonium phosphate in amount equal to one-half per cent. of the total solution. This causes a rapid division or growth of the bacteria so that during the next twenty-four hours, with all conditions favorable, the liquid will become so filled with the organisms that it will appear slightly milky or cloudy. It is then ready to apply to seed or to be mixed with soil, either method being effective for carrying the bacteria into the soil. One gallon will moisten at least two bushels of seed which should then be spread out to dry but not so as to receive the direct sunlight; if mixed with soil for top dressing the same amount, one gallon, will impregnate sufficient soil to spread over four acres (or less). By hand-sowing, a wagon load will be sufficient for this area.

The successful issue of last season's experiments brought about a demand for the cultures which the Department of Agriculture could not have anticipated, nor is it probable that our laboratories could have met the demand in any case. Early in February we found that we had already listed as many applicants as we could accommodate up to July 1st and since that time we have been unable to furnish cultures except in cases where, for special reasons, a test appeared necessary. This fall and next spring, however, the distribution will be continued as far as our limited facilities permit, but our lists will not be made up more than two months previous to seeding time.

Naturally we have had a great many inquiries in regard to the quality of the cultures obtainable from commercial sources. We can only say that the bacteriologists for such concerns have been given all the information necessary and that there is no reason in the nature of the process why they should not ultimately produce as effective cultures as those sent out by the Department. As far as our examinations have gone of any cultures prepared according to the Department dry-culture method, we have had no reason to believe that this culture work is not being properly done. The patent which the Department holds on the method of growing and distributing the bacteria prevents anyone from obtaining a monopoly and it is likely that by another season there will be a considerable addition to the list of firms offering these cultures for sale. By competition, therefore, the cost to the farmer or gardener will undoubtedly be much lessened and the wisdom of the Department's course in patenting the method is already demonstrated. Thus the benefits of the discovery will be brought within the reach of all, whose soil conditions call for artificial inoculation.

Before investing extensively, however, in any new method for increasing crop yields, whether bacterial or of a different nature each man should determine by small experiments its value for his peculiar needs, and not be unduly influenced by results obtained perhaps under widely differing conditions.

The CHAIR: No. 2 on the program will now be taken up. "The Proper Theory of Farm Fertilization," by Prof. Wells W. Cooke, Washington, D. C.

Prof. Cooke's paper is as follows:

THE PROPER THEORY OF FARM FERTILIZATION.

BY PROF. WELLS W. COOKE, *Washington, D. C.*

The answer to the question of the proper theory of farm fertilization has been given in various ways by different speakers and writers. The one to be given here is based on the idea that no theory of farm fertilization is correct unless its teaching can be followed year after year and generation after generation, and the soil still remain in excellent condition for the production of large crops. But before proceeding to the enunciation of this theory, it will be well to consider some of the theories that have been popular and are still heard from the lecture platform. Most of these theories are based on the idea that we should aim to find out what plant food is in the soil, what elements are most lacking, and then supply this deficiency. All agricultural soils contain large quantities of plant food. A fair average for a good soil in the upper foot per acre is about 8,000 pounds of potash, 4,000 pounds of phosphoric acid and 5,000 pounds of nitrogen. As compared with the amount of each of these elements required by a single crop in one year, these quantities are enormous.

Some of the common farm crops extract from the land the following amounts of plant food per year:

	Nitrogen.	Phosphoric acid.	Potash.
	lbs.	lbs.	lbs.
Wheat, 30 bushels and the straw,	48	21	29
Oats, 60 bushels and the straw,	73	26	62
Clover, 2 tons,	102	25	83
Potatoes, 200 bushels,	50	27	70

Each acre, therefore, has enough of the elements of plant food for many generations of crops. But fields differ and while one may be richer in one of the elements than the figures given above, it may be quite lacking in some other element.

One of the earlier theories of farm fertilization was based on the idea, that by chemical analysis, what the soil was most lacking could be learned, and then this lack supplied. When the agricultural colleges were founded more than forty years ago, one of the principal aids they were expected to bring to the farmer was along this line. The farmer was to send a sample of his soil to the college, the chemist would analyze it and then send back word just what fertilizers to apply. But when the colleges were started, the agricultural constituency was surprised to learn that chemical analysis could not help them. The chemist could of course analyze the soil, but in their poorest soils where they could not grow profitable crops, he would find enormous quantities of plant food. The trouble was that the chemist used strong acids and learned the total amount of plant food present, but he could not tell whether or not it was available for the plant, and where he found ten thousand pounds of food there may not have been ten pounds in such condition that the plant could use them, therefore, his analysis was of no agricultural value. Of late years the attempt has been made to devise some method of analysis that would show the amount of available plant food in a soil. So far success has not been attained and if the later ideas of this paper are correct, then the solution of this problem would be of scant use to agriculture.

When the agricultural colleges realized that chemical analysis would not aid the farmer in his search for the proper fertilization of his farm, they evolved a new scheme. They said, "Ask the land and the crop what is needed," and they advocated what are called fertilizer plot experiments. The plot of land selected was divided into several long narrow strips, one was fertilized with a complete manure containing nitrogen, phosphoric acid and potash; a second with the same omitting the nitrogen; a third omitting the phosphoric acid and a fourth omitting the potash. If the removal of any one of the elements caused a decrease in the crop, it showed that the soil was deficient in that element. Many combinations have been tried in addition to those mentioned above and many hundreds of these tests have been carried out in various parts of the United States. Their value to agriculture has been almost nothing and for these reasons. If the tests are successful the most they can tell you is a year later than the information is needed, for the results indicate what the field needed at the beginning of last season, but not what it will need next season, after the present year's crop has

drawn its supplies of plant food from the soil. It may indicate what is needed for the special crop grown but it does not show what may or may not be needed by a crop of another kind on the same soil; nor does it offer any solution to the problem of what is needed in another county, on another farm or even on another field of the same farm.

Nearer a correct theory of farm fertilization were those who have advocated the doctrine: "Add to the soil what you expect the crop to take from the soil." But even this theory does not go quite far enough. The fundamental objection to all the earlier theories is that they were seeking some way by which the addition of a partial fertilizer would produce a full crop. In other words, they sought to add only part of the plant food needed and expected the crop to obtain the remainder from the store of plant food already in the soil. Such theories are not correct, for they violate the rule laid down at the opening of this article. If such a scheme of fertilization was carried on for a long term of years, it would eventually impoverish the ground.

The correct doctrine is that one which instead of striving to see how much of the needed fertilizer can be secured from the supplies already in the soil, looks on all the plant food in the soil as so much working capital, to be used as needed, but never to be reduced and to be augmented continually for the production of better and larger crops.

The last theory mentioned is not quite correct, because all plants need at their command a good deal more plant food than is to be removed in the crop. Thus in the case of clover, a crop of two tons to the acre removes about 80 pounds of potash per acre. Nevertheless the crop at the beginning of the season must have at its disposal much more than this 80 pounds of potash, for the roots and the stubble of the clover contain about the same amount of plant food as the top, so that the plant actually takes from the soil twice 80 pounds or 160 pounds of potash. But this is not all. The clover root will not fill all of the soil, but if the plant is to do its best, if it is to raise the largest crop possible, every inch of the soil must be full of plant food, that wherever the clover roots go in search of food they can find a bountiful supply all the time. How much of this surplus supply is needed for the best growth of the plant cannot yet be stated with exactness, but it is known that it must be at least twice as much as the plant is to use. Therefore, if one expects to raise two tons of clover per acre from a given field, he must be sure that each acre contains at least 320 pounds of available potash.

The proper theory of the fertilization of the crop, therefore, is the

addition of so liberal an amount of plant food as to make it certain that the land contains more fertility than the crop will need. This should be continued year after year that the farm may be continually growing richer.

The opposite plan has been far too often used in this State. Everywhere may be found farms whose owners have endeavored year after year to get as much as possible from the land and return as little. I do not believe a man can be a good Christian, and I know he is not a good citizen, who handles his farm in such a way that it becomes poorer year by year. Each should remember that he is not the owner of the land, but its steward. Other generations and other farmers are to follow him and the land will be used as a source of human food long after he has departed. If he allows the farm to run down, he is entailing an extra amount of labor and expense on his successor, for it requires much more work and cost to bring up an impoverished farm, than to continue a good farm in its present state of excellence.

In addition, however, to the duty one owes to his posterity and to mankind, no farmer can afford to let the fertility in his land run down, even from the standpoint of present gains. The average crop does nothing more than pay expenses. It is only the large crop that pays a profit and everyone knows that this large crop can be raised on nothing but good ground well supplied with plant food. As with animals, so with plants; if the crop is to do its best it must have at its command all the time all the food it can use. In other words the soil must be so full of plant food that no matter which direction the roots grow they will find an abundance of food.

This, then, in short, is the proper theory of crop fertilization. Be sure that the crop has at the outset all the plant food it can use and add each year more fertility than the crop has removed. But some one may object: "Will not this be wasteful?" If so much plant food is present in the soil, will not some of it be lost before the crops have a chance to use it?" Herein lies one of Nature's most wonderful contrivances for aiding the farmer. Nature has given soil a certain holding power, so that very large amounts of phosphoric acid and potash may be added to a soil and yet none of this will be carried off in the drainage water; it will be held strongly by the soil. And yet as soon as the root of a plant comes through this soil seeking for food, the soil loosens its hold and allows the plant the nourishment it desires. This beneficent result is brought about by the fact that the plant does its feeding at the end of its roots and that the point of each root is continuously secreting a small quantity of acid and this acid dissolves and makes available the plant food held so strongly by the soil that rain water could not

loosen it. It is possible, therefore, for the farmer to put on at one application enough of phosphoric acid and potash for a generation of crops and have no fear of its being carried out of the soil except as the crops make use of it. All the loss there is by the extra fertilization is the interest on the cost of the fertilizer.

If the same could be said of the nitrogen, then the whole problem of farm fertilization would be much simplified. But, unfortunately, soil has not this holding power for nitrogen and still more unfortunately, nitrogen is the most expensive element of plant food. The most difficult problem of farm fertilization is the economical handling of the nitrogen supply. Nitrogen exists in several forms and combinations. It exists pure in the form of a gas and in this form is of no value to most of our crops; it exists in combination as the nitrogen of organic matter in such substances as bone meal, cotton-seed meal, dried blood and the solid portions of barnyard manure; and finally it exists as the nitrogen of ammonia and as the nitrogen of nitric acid or nitrates. In only one of these forms can nitrogen be safely applied in large quantities and that is in the insoluble form of organic nitrogen. So long as the nitrogen remains in this solid form, so long it will not wash out of the soil and be lost. On the other hand, just so long as it remains in this form, it can be of no use to the crop, for all crops take up their food in the liquid form, and this solid organic nitrogen must decay, it must be broken down by the action of the various germs in the soil and changed to nitric acid or nitrates before it can become available to the crop. Then as soon as it has been converted to this available form, if there are no plant roots to absorb it, there is danger that it will be washed out of the soil by the next rain-storm.

The economical use of nitrogen demands that it be applied in more than one form. If an immediate effect is desired, the nitrogen should be employed in the forms of nitrate of soda or sulphate of ammonia that are available as soon as a shower washes them to the roots of the plants. A little slower action is obtained by using dried blood or cotton-seed meal or any form of animal matter that decays quickly and easily. When, however, it is desired to make a heavy application that shall last through the whole of a rotation, there is probably nothing better that can be used than stable manure. Part of the nitrogen in ordinary barnyard manure exists in the soluble form and is immediately available to the crop of the first year. Another portion decays easily and is used by the crop of the following year, while a third part is more slowly attacked by the germs of the soil and furnishes nitrogen to several successive crops.

The theory of plant fertilization here advocated may be summed up as follows: Add a liberal supply of phosphoric acid and potash

to the soil so as to make it certain that the crops have all they can possibly use of the elements.' Add nitrogen in such forms and quantities as to furnish at all times a liberal supply and yet no considerable surplus. Add each year to each field more plant food than the crop has removed. Under these conditions you know that you will raise each year the largest crop possible under your given conditions; that the farm will be growing continually better under your hand, and that when you are called to resign your stewardship you will have the commendation of your own conscience—"Well done, good and faithful servant."

The CHAIR: The next number on the program will now be taken up. "The Cultivation of Mushrooms," by Thomas Sharpless, of West Chester, Pa.

The address of Mr. Sharpless is as follows:

THE CULTIVATION OF MUSHROOMS.

BY THOMAS SHARPLESS, *West Chester, Pa.*

Mr. Chairman, Ladies and Gentlemen: I do not know who is responsible for putting me on the program to talk to you about the cultivation of mushrooms. What knowledge I have gathered is from other people and some little experience I have had myself. The cultivation of mushrooms is not strictly agriculture but it is an adjunct, helping out the sometimes meagre profit of the dairying business of this section of the country. It is a business in which there is a great deal of labor, and no person wishes to undertake it at all unless he is able to command that labor. As an addition to farming or the dairy where a man is compelled from necessity to keep a very considerable amount of labor about him, he can work in some mushrooms to advantage, but nobody wants to go into it with the idea that it is a soft snap and there is nothing to do.

Now, I hardly know where to begin in the matter; but I drafted a few notes and I presume that the beginning would be, probably, the preparation of the manure for the bed. The scientific people, of which I am not one, tell us that the mushroom is composed mainly of nitrogen, so we buy manures that are rich in nitrogen, horse-stable manure being our best source of nitrogen supply for the manufacture of the material to make the beds of. This manure must

not be burned; it must be made into a compost, and the nitrogen that is contained therein, which is very volatile, must be saved. Unless your manure is made into a thorough compost, you are not going to get any mushrooms, and to accomplish this, and you all are familiar with the fact, horse-stable manure thrown into a pile in two or three days will heat and turn white and then your nitrogen is gone out of it and it is good for nothing to raise mushrooms, so when you get your mushroom manures delivered on your ground, the first thing you must do is to wet it. You will never get a compost until it has been thoroughly wet. Then you must turn it every day or every two days, or it will heat very hot, up to 140 or 160 degrees, and if it does, you will lose your nitrogen out of it, and as I said before it will be good for nothing to raise mushrooms. So you must turn it every two or three days until it is done heating. When the temperature begins to fall, when it has gone down to, probably 100, or somewhere in that neighborhood, then you may safely let it lie until you are ready to make your beds; then it must be thoroughly composted, because your mushrooms won't grow except in a thorough compost rich in nitrogen.

Now having prepared your manure you put it in your bed. I shall probably have to explain a little about the building of the houses, but I will do that later on. When you put it into your bed, put it into beds approximately a foot deep. It should be tramped or rammed down pretty solid, quite solid in fact. But there is one point I omitted. When the manure is first hauled, I usually put soil or loam on it. The books say one-third loam or one-third soil. Our friend who first spoke said that soil was a great conservator of nitrogen, and the earth, as we can understand, is put in there to help hold and retain the nitrogen which you wish to transfer into mushrooms. Then after you have put it into beds, practically about a foot deep, some say that ten inches is enough, but I guess a foot is rather better, it will probably heat up again. It will probably go to 125 or 130 degrees. If it shows signs of burning, it is because you have put it in before it has thoroughly done heating. If it begins to burn, you must wet and cool it down. When it has shrunk to 100 degrees or, probably better still, to 90, you may put your spawn in there. The spawn is buried under the surface of the manure, probably an inch to an inch and a half. A mushroom is a thing that grows on top of the ground. The spawn runs on top of the ground; then it is "cased over" as we call it; that is, it is covered with about an inch of fine loam. Now there is one very important thing to be taken into consideration and that is, Nature does everything right. The mushroom grows well in a native state in our fields; however, a long protracted dry spell is often followed by heavy rain and hot sun. Now if you put your manure into your beds too wet, I have had a

little experience in that line myself, you don't get any mushrooms. The manure should be a little dry rather than too wet. If you take up a handful of manure into your hand and you squeeze the water out of it, you had better pile it up and let it dry. If it will just simply retain its shape, it is pretty nearly in the right condition.

Now as to spawning your beds. I have constructed racks made out of plastering lath four feet square, nailed across eight inches making a square of eight inches. I find that is preferable to any other plan of regulating and putting in the spawn, because it distributes it evenly all over the beds. Then we dig a hole in every open place and cover it up with manure. It should be covered about an inch deep with manure. After it has been spawned, you want to cover it with an inch to an inch and a half of soil; then you want to wait forty days anyhow before you can tell whether you have done anything at all or not. Possibly at the end of forty days you will begin to see little white specks come up all over your beds. Sometimes it don't come in forty days. One man told me a few days ago that he waited fourteen weeks before he ever saw a sign of a mushroom. Sometimes it never comes at all owing to the manure not being in the right condition or the plot not having been kept in the right temperature, either too warm or too cold. It is a pretty delicate matter to have every condition just exactly right.

There are three kinds of spawn available upon the market: There is the imported English spawn, the American spawn, and there is what is known as the Missouri spawn. These last two are grown in this country. The English spawn is the one that is used more where I live than anything else. I never tried the Missouri. I have tried a little of the American spawn, and I got an exceedingly good crop of very fine mushrooms. Three successive crops grew on the bed and then I quit. I find that the English spawn keeps up a succession of crops better than the American spawn that I have. The temperature at which the building should be maintained is usually, in the early stages—it should be kept at about 65 degrees, although I have grown as fine mushrooms as I have ever grown at all at a temperature of 54 degrees, but you want to keep your temperature up a little at the start while the spawn is running. After it has run and the mushrooms begin to show, you can very safely drop your temperature down to about 54 degrees. They won't come up quite as fast, but you will get finer and larger mushrooms at that period of growth.

We had on our place, after I got the mushroom fever, a plot I thought suitable and I conceived the idea of planting mushrooms in this part, and I have been exceedingly successful with them in a small way. I have no means of warming this place, so as the cold

weather came on, they finally quit growing, and the beds finally froze up solid, as hard as stone.

We let them alone and this spring they thawed out and when the temperature arose to 50, the mushrooms began growing and they have grown remarkably fine mushrooms, and the temperature has never been up to 56 yet, and we are still getting a few of them although the beds are getting pretty well exhausted. The conclusion I have arrived at in the matter of temperature is, that after the mushroom spawn has run, 54 degrees is the better temperature to keep your room than probably any other temperature that you can keep it.

Now in the matter of watering and regulating your beds. Your mushrooms won't grow without water, and many growers water them, I think, about once a week, some with water tempered, others with the cold spring water that they may happen to have. My habit has been—we heat our house with hot water—my habit has been to use warm water; just simply take the chill off. You don't want to make your beds too wet, and yet you want to wet them enough. When it comes to the quantity of water that you should put in, I am frank to say that I don't know. I know that you don't want to keep the top of your beds too moist. You must thoroughly wet the manure all the way through, and the beds must be free from surface water, although I remember that on one occasion, when my beds were not producing very well, I watered them thoroughly and got a fine crop of mushrooms afterwards, so that the rules of the books do not always go in practical experience.

I presume the question would arise probably with some of you, What kind of a building will you put them in? The construction of those buildings that I have begun to use—they were mainly lumber buildings with double walls lined with building paper and made absolutely dark, and usually putting from five to seven beds into them in height, that is, the first bed being on the ground floor and so on up. That is the way we always do with the beds. Your bed that is down in the dirt will always yield you more mushrooms and it will last longer and bear longer than any other bed you may have in your house. The beds are put in on frame-work at a convenient distance for picking, between twenty and twenty-two inches apart from the top of one bed to the bottom of the next. The beds are made about six feet wide; that is about as long as a man's arm is usually able to reach, and he reaches half way across the bed, goes up one aisle and picks what he can reach and then goes down the other aisle and picks from that. The building should be so arranged that an even temperature can be maintained. It should be heated uniformly. My building is heated with hot water, which I

believe to furnish a rather more uniform temperature than any other process of heating. You do not want a dry heat like a fire would make; you want a damp, moist atmosphere. You want your room as near absolutely dark as you can have it. The mushroom is a plant or a fungi, or whatever you call it, that prefers to grow in the dark.

The matter of ventilation is an open question, a very decidedly open question. When I built my house, they told me that I should provide for thorough ventilation. Once when we had the dumps pretty badly—mushrooms have a lot of diseases that you have to look out for and take care of—one of my neighbors rather laughed at me and told me I hadn't ventilated enough and yet in this upright arch that I have there is not a bit of ventilation. There is an opening at the top that I could open and ventilate but it hasn't been open and ventilated since away last fall, when it froze up. I patched the door up until it was practically air tight. The rest of it is solid stone wall, and absolutely there has not been a bit of ventilation and yet I have grown the finest mushrooms I have had right in there. I know of another grower of mushrooms who has his beds entirely under ground, absolutely under ground and covered over, so that the sod and grass are growing on the top of them. He don't ventilate at all, and yet he grows exceptionally fine mushrooms and ships them all to the New York market, so that the question of ventilation, I say, is an open one. I do not know myself which is right, and which is not, although I provided for ventilation in my building, and whenever I could I have thrown the windows open; and it is provided with draft windows, and whenever I could I have thrown the windows wide open and I rather expect it is probably the right thing to do, because cold don't hurt the mushrooms even in winter weather. I am pretty well satisfied that you may freeze them solid because my experience has been that they will stand freezing without injury, in fact they will freeze as hard as frost can freeze them and yet when they thawed out they came right along and produced quite a fine crop afterwards.

Now I suppose that some of you would like to ask some questions, and I have but little more to say except that as soon as you have extracted all the nitrogen of the manure, that is one of the considerations, you have practically nothing left save what phosphoric acid and potash and what vegetable matter there may be of which the manure is composed. I thought at first that this manure was of very little value; I do not think yet it is of very much value, still it may have some value. Last fall we hauled it out and spread it with a manure spreader on two fields, and this spring I can distinctly see the marks across one of the fields where this manure went, whether it is a matter of the humus or whether it is the phos-

phoric acid and potash that is left in it I can't say, although potash, as a rule, does no good on our place at home. I don't know whether there are any other points that I should have covered that I have not covered, but if you will ask me questions I will try to answer them.

COL. DEMMING: I would like to ask if Mr. Sharpless ever found poisonous mushrooms coming up in his beds?

MR. SHARPLESS: Yes, some little fellows came up, but nobody would mistake them for mushrooms at all; they are differently constituted. There is a wonderful variety of little fungi that grow up, long, hairy, beautiful little growths that grow to about that height, of white filmy stuff that also got little cups. They grow up to about one-eighth of an inch in height and form little black seeds in there. They come up sometimes with a round top that reaches down an inch or more, but nobody would ever mistake them for mushrooms, in fact, the edible variety of fungi is large. The ordinary puff ball which grows in the field, which sends out a sort of smoke when you step on it, in its earlier stages, is said to be a great deal better than the mushroom. The mushroom in the condition in which we pick it to send to market must be in a button form. If you send them down to market open they will tell you to pick them sooner, and yet nothing that I know of ever gets to perfection until it gets pretty nearly ripe. Your apple is not good until it is ripe, nor your peach nor your pear; neither is your mushroom. When we want to eat some at home we always pick out those that are ripe, but you can't send that kind to market. I think there is no danger whatever of ever raising any poisoned toadstool in your mushroom beds.

MR. SCHWARZ: During how long a season can you cut them?

MR. SHARPLESS: About from three to four months will take your crop out. Now while you are on that question, I will say this much further about the American spawn. From a bed of American spawn, as I said, I got three successive crops of very fine mushrooms and then they quit, absolutely quit; so I took the English spawn, and re-spawned those beds, and that was in Janaury, and they have not come yet. I presume the temperature has been too low for the spawn to run, although I have watered them and done everything to them that I know how and they still have not come, and I suppose never will.

COL. DEMMING: The question was asked because I have had some experience in raising mushrooms, and I found out by my

experience that there are some 1,100 varieties in the United States, and of the 1,100 varieties only ten are poisonous. I found, furthermore, that the greatest enemy of the mushroom is the wild rabbit.

MR. SHARPLESS: The wild rabbit don't get into our mushroom houses, and we have no trouble on that score. We don't grow toadstools and there is not any danger of getting poisonous toadstools mixed with marketable mushrooms. The great majority of fungi are edible and some of them are better than the mushrooms.

Questions and Answers on Prof. Robinson's Paper.

G. R. HENDRICKS: In the ordinary way of sowing clover seed on top of the soil exposed to the rays of the sun, is its usefulness impaired as an inoculative agent?

PROF. ROBINSON: For practical purposes, no. There will be enough bacteria uninjured to perform the office required.

MR. HENDRICKS: The Department of Agriculture in one of their circulars state that the inoculating material could be made up at a few cents per gallon. Why do the seed men ask two dollars per gallon?

PROF. ROBINSON: With reference to making up the solution in which the bacteria are grown, the "few cents a gallon" refers only to the cost of the nutrient salts, and does not include the production of the pure culture necessary as a "starter." As to the price of two dollars a gallon asked by the seed men, I think I can state that in another season the expense will be very much lower. Of course commercial production with advertising, postage, etc., entails expense that is higher than the expense to the Agricultural Department; still the expense is bound to come down very much.

MR. WAYCHOFF: Can simple directions be given by which the ordinary farmer can propagate his own nitro-cultures economically?

PROF. ROBINSON: That is impossible for the reason that the cultures can only be produced in a bacteriological laboratory. Of course when he has a dry culture for a starter with the special directions accompanying it he can make up his liquid culture, in a large amount at little expense.

MR. DRAKE: Will land produce a good crop of clover when the bacteria are not present in the soil?

PROF. ROBINSON: Yes, if there is sufficient nitrogen in the soil for the plants to feed on, a good crop may be produced, but growth is more normal and healthy when the bacteria are present to assist.

MR. NAGINEY: What time would you recommend for sowing inoculated seed and soil for alfalfa?

PROF. ROBINSON: Probably late in the spring would be the best time for sowing for this latitude, although fall sowing of alfalfa has done very well in many cases.

MR. WAGNER: Would not the best culture for alfalfa be cultivated by growing Bokhara or sweet clover in a clean healthy soil?

PROF. ROBINSON: Provided the other conditions of the soil were suitable, the sweet clover bacteria would favor the alfalfa.

MR. GLOVER: In this latitude would you prefer a seeding of alfalfa in spring or fall and with or without a nurse crop?

PROF. ROBINSON: At the ordinary time of sowing in this latitude, without a nurse crop. Be sure to have it free from weeds. It is probable that late spring sowing is preferable for this latitude, although in many cases it has been shown that alfalfa does very well when sown in the fall.

PROF. SURFACE: How long will the bacteria exist in the soil without leguminous roots on which to multiply?

PROF. ROBINSON: Probably from four to five years. That is a matter that has never been thoroughly worked out; it is very hard to say.

MR. MILLER: Can we get cultures from the National Department of Agriculture at anytime?

PROF. ROBINSON: Well, for instance, just at present we are unable to promise them; up to July 1, we have listed ahead practically all that we can send out. More will be sent out this fall, however.

MR. SEEDS: Can you tell why it is that some legumes do well and prosper without getting nodules on the roots?

PROF. ROBINSON: It must be because they have an adequate amount of nitrogen in the soil.

PROF. BUTZ: What can you say as to the character of the cultures that are sent out by the seed houses?

PROF. ROBINSON: Well, of course, we cannot guarantee them any more than we can guarantee their seed. We intend to keep

track of these things; so far as our examination has gone up to this time. we have no reason to believe that they are not being properly prepared.

A Member: Would you expect in growing a leguminous crop upon a fairly fertile soil and where presumably the bacteria were not present that the crop would be benefited from the use of inoculation?

PROF. ROBINSON: For a leguminous crop?

A Member: Yes.

PROF. ROBINSON: I should, yes, other conditions being right.

A Member: Do you think that the influence of bacteria just at that time is beneficial and likely to increase the crop?

PROF. ROBINSON: I think that is probably so.

PROF. SURFACE: Can we get a proper variety of bacteria for inoculating San foin?

PROF. ROBINSON: We have had a culture for San foin but it is not now active.

PROF. SURFACE: Will the varieties for red clover, alfalfa and soy beans do for this?

PROF. ROBINSON: Probably not. A specific culture is much more satisfactory and will give better results within the same length of time.

MR. M. P. HALLOWELL: Where can alfalfa inoculation be obtained and how much is needed per acre?

PROF. ROBINSON: A gallon of solution will treat about two bushels of seed; a quart of solution will treat enough for one acre at least. It is obtainable from the Department of Agriculture if you apply in time. There are several laboratories sending it out.

MR. CHARLES MILLER: Describe what specific eliminative effect soil inoculation by bacteria may have, if any, upon acid soils? In other words, will it tend to extinguish sorrel or weeds of a kindred nature?

PROF. ROBINSON: It will not. In such a case it will be necessary to correct this condition by some suitable agent, such as lime.

MR. AGEE: We farmers have learned to look to our experiment stations for tests in the new things. Now in Bulletin No. 214, I see but one report from an experiment station concerning the cultures sent out to the various stations. Could you tell us what the reports from the stations were, whether the reports were generally favorable or unfavorable.

PROF. ROBINSON: We did not get very complete returns; we had quite a voluminous report after the bulletin was out from Alabama. It was generally unfavorable, due to soil and climatic conditions.

MR. AGEE: I saw a report from only one station from all over the United States.

PROF. ROBINSON: There were two station reports included in the bulletin; others received up to that time, not more than four or five, were indecisive.

Questions and Answers on Prof. Wells W. Cooke's Paper.

MR. McCLELLAN: Is there any way of hastening the action of the nitrogen contained in the solid manure so as to make it available as plant food?

MR. AGEE: I was struck with the name that was added to that question, that is from my friend Mr. McClellan, up in Knox, Pennsylvania. You that have been up through his county, Clarion county, know that he is up on the roof of the world and the season is so short that I don't wonder that he wants something to hurry up the action of farm manure. He can do that by applying the same method used in England in a similar climate, that is by the composting of the manure. Down in the southern part of the State where the season is longer, that is just what you don't want to do. You want to save every bit of the organic matter, vegetable matter, as well as the plant food, and you better let the action of the manure be a little slower in order to save the organic matter rather than to undertake to hurry it up by composting the manure beforehand.

MR. SEEDS: Does the colored water running out of the barnyard take away the fertility, and can land be cropped and made fertile without concentrated fertilizer or barnyard manure?

PROF. COOKE: It probably does; wherever you see colored water running out of a barnyard, you may be sure that some plant food is connected with it because there is no soil there; nothing to catch and filter any of the plant food running out of that colored water, but when you see colored water running away from a field, it does not necessarily follow that plant food is being lost, because if that colored water is running over soil, the chances are that the soil has taken out the larger part of the plant food.

MR. GLOVER: Can the fertility of a farm be maintained without the aid of commercial fertilizers by feeding the hay, clover and timothy and fodder on the farm and converting all the straw to

manure, when there is a loss of the part of the liquid manure in the stables or in the yard? Will green crops plowed under help out in this case?

PROF. COOKE: I have another question here that is substantially like that; contains about the same idea.

"Is there any way of building up a farm without putting anything on it, without commercial fertilizer or barnyard manure?

Well, there is if you want to take time enough to do it. If you are willing to wait to build it up slowly enough, but I doubt whether we can afford to wait for that, building up by a longer and slower process to enable us to attain this end.

To go back a couple of hundred years, it was then customary to turn the land out and let it lie fallow until such a time as Nature would help to bring it up, but in this modern generation we have given up the fallowing of land, and I think it is better to add something to it and hurry up the process.

A Member: How can a farmer successfully conduct his affairs and produce his crops without a greater knowledge of chemistry; and how can a farmer successfully fertilize his soil without being able to ascertain the proportion of plant food the soil is deficient in?

PROF. COOKE: Well, the idea that I attempted to convey in my remarks was, that the amount of plant food that was in the soil is just so much, and we are to keep adding to that as we take off crops from the soil, so that whatever you think your crop is carrying away, you add to it; be sure that you have got enough there; it does not make any difference if you have got a surplus; the more the better.

A Member: Would you be governed entirely by the composition of the crops to be raised as to what you would apply?

PROF. COOKE: The first year the application would be merely to put on enough; be sure that I had enough, if I was going to put on potash I should do as I have done a good many times; I should—

A Member: What would you do the second year?

PROF. COOKE: After I was sure that there was plenty there, then I should be governed largely by the amount of plant food that I considered had been extracted from the farm by the crops; after I got enough so that I knew there was plenty in there, I should be governed by the amount I considered had been taken off.

Several members questioned whether fertilizers would not be wasted if applied in the way advised by Prof. Cooke in his paper, to which Prof. Cooke replied in substance as follows:

PROF. COOKE: I think you must have misunderstood what I intended. I think you misunderstood what I meant as to nitrogen being just as good for one plant as for another. A pound of phosphoric acid is just as good for one plant as it is for another. These plants may want different quantities. There may be forty pounds of phosphoric acid available in a given field and that might be enough for a crop of corn where it would not be enough for a crop of wheat. A pound of phosphoric acid would be good for one or the other, only they may be different in the quantity they want.

MR. SEEDS: A man might waste a great deal of plant food because he don't know how much to put on.

PROF. COOKE: So far as the phosphoric acid and potash are concerned, they are not wasted. They are there. Their action is just postponed until they are needed.

MR. HALLOWELL: What commercial value has the clover root?

PROF. COOKE: As I stated, the analysis of clover root is not much different from the clover top, so that a ton of dry clover root has about the same value as dry clover hay.

MR. SHARPLESS: Explain the action of land plaster on the soil.

PROF. COOKE: Well, that has a sort of double use. Land plaster has some effect toward conserving moisture. It rather tends to catch and hold moisture and helps to carry the plant through a dry time.

Evening Session, Wednesday, May 24, 1905.

J. Milton Lutz, Chairman, called the meeting to order at 7:30 o'clock.

The CHAIR: We will now be entertained with a whistling solo by Miss May Stewart Smith.

Miss Smith rendered a whistling chorus, "Maid of Dundee," and responded to an encore by giving the familiar air, "Comin' Thro' the Rye." Miss Mary Elree acted as accompanist.

The CHAIR: We will now be entertained with a violin solo by Miss Cooley, of Downingtown.

Miss Cooley played a violin solo which was well received. Her accompanist was Miss Irwin, also of Downingtown.

Discussion of Prof. Cooke's paper was resumed:

MR. STOUT: Is it advisable to apply as much as a ton or more of nitrate soda at once on an acre of asparagus?

PROF. COOKE: I should say not. There is no acre of asparagus that can come anywhere near using that much nitrate of soda. It is customary to put on more nitrate of soda than the crop can use up, putting it on so that we can be sure of having enough.

MR. WAGNER: Is not the soluble mineral matter of potash and phosphoric acid lost in the liquid manure if applied to a soil, especially on hillsides, when there is no plant growth to take it up and heavy rainfall to carry it off?

PROF. COOKE: Not if the soil is in such condition that the liquid manure can ever get into the soil. Of course if the hillside is very steep and then a heavy rainfall comes so as to wash the whole thing off the hill, it will be lost.

A Member: Can the fertility of a farm be retained without the aid of commercial fertilizers by feeding the hay and fodder on the farm?

PROF. COOKE: You can't build up a farm unless you bring something from the outside or else save every bit of the fertility produced on the farm; even then the process of building up will be very slow.

A Member: Will corn crops plowed under help out in this case?

PROF. COOKE: What you are doing in all this sort of operation is, merely helping to set free the plant food that is already in the soil. You are not adding anything; you can't build up the amount of plant food there in that way; the most that you can do is to keep the farm from running down.

MR. PERHAM: Is it advisable to sow nitrate of soda on sod for growing grass?

PROF. COOKE: Nitrate of soda is an expensive plant food. Hay is one of the comparatively cheap crops, and I very much doubt if there are many conditions in Pennsylvania where a person can afford to pay for nitrate of soda to raise grass.

A Member: Will Nature not take care of the soil and make it better at all times where man does not interfere?

PROF. COOKE: If you turn the soil out and leave it to itself, it does improve in the sense that some plant food there becomes available; it is a very slow way, though, of doing it.

A Member: Does not Nature make new soil and hence new available plant food from the rocky crust of the earth?

PROF. COOKE: It does, but this is too slow for our modern agricultural methods.

MR. B. F. KILLIAM: Do we get proper plant food by using commercial fertilizers in sufficient quantities?

PROF. COOKE: So far as the mere plant food is concerned commercial fertilizers fill the bill completely, but that is only one-half of the story in the successful growth of crops. We must have a proper mechanical condition of the soil, and that is controlled by filling the soil with humus, so that if we want to raise crops on commercial fertilizer, we will in some way or other have to provide for the getting of vegetable organic matter into the soil. The commercial fertilizer is all right as the source of nitrogen and potash.

MR. SEEDS: Would you say that nitrate of soda or potash on clover—that nitrate of soda would not be of any use to the clover if it had once gotten a start, as we were informed this forenoon, if it had the nitrifying bacteria on its roots?

PROF. COOKE: The potash is a direct food to the clover and the clover needs potash more than any other of the plant foods.

The CHAIR: You will next be entertained with a talk on the "Consolidation of Rural Schools," by Mrs. Mary A. Wallace, of Ellwood City, Pennsylvania.

The paper read by Mrs. Wallace is as follows:

CONSOLIDATION OF RURAL SCHOOLS.

BY MRS. MARY A. WALLACE, *Ellwood City, Pa.*

Before beginning a discussion of the subject assigned me this evening, I desire to say that it is one in which I am intensely interested. I am not of those who think that whatever was good enough for them when they were children should be good enough for the children of the present day. If it had not been for the great, progressive, far-seeing minds of the past, what think you would have been the condition of our country to-day? And next in importance to the conception of the Declaration of Independence, was that of our free educational system. It was an innovation, a startling innovation on the old plan, when facilities for giving children an education were only within reach of monied families. The idea of taxing all to educate all was for a long time unpopular, but when men learned by observation, that our institutions could only be main-

tained by the spread of intelligence among the masses, all intelligent opposition ceased.

The school and the State are interwoven in the texture of our Constitution, and government and education are the cause and consequence of each other. The destiny of the nation, and the destiny of the common school are one and inseparable; maintain the one and you uphold the other. I believe that in the years to come when great empires and kingdoms shall be wrecked amid the storms and cyclones of revolution, this Republic will stand securely, so long as our public schools are managed wisely and well. If education had been left to the family, all the languages, the traditions and customs of the old world, would have been transplanted with new life into our American Republic, and instead of being one people, with one language, we would soon have become a people of many languages, and divers customs equal to, if not worse than Russia to-day, with her numerous dialects, and a dozen distinct languages. For several years I happened to be what was designated "educational editor" of a Pittsburg daily newspaper. One of my duties as such, was to visit all the schools of the city at least once each year, and of course "write them up" for publication. I wish friends that you could all go with me to some of the ward schools in the down town districts of that great Western Pennsylvania city, that you might see the children of the German, the Frenchman, the Italian, the Hungarian and the Slav, and of foreigners from every clime, yielding up the language and traditions of their fathers and paying willing homage at the shrine of our ancestral Saxon. In thus calling your attention to the mighty influences of the public school, I have digressed somewhat from my subject, for which I hope for your pardon.

The more important problem for rural communities to solve to-day, is not how to grow alfalfa, nor how much lime should be applied to an acre, nor any of the many agricultural problems discussed at our Institutes, but it is how best to secure the benefits of a graded school system for the farm children. I would impress this thought upon you, that the more important problem for rural communities to solve at the present time, is how best to secure the benefits of a graded school system for the farm children, and instruction in the higher branches of learning, without them being obliged to go from home. Many farmers do not feel able, in fact, have not the means to send their children away to school, and others do not find it desirable to change their place of residence as some do in order to give their children a better education, than the rural schools afford and consequently, as Dr. Schaeffer, our Superintendent of Public Instruction aptly says in one of his reports: "The larger educational advantages are limited to a very few of the boys and girls upon the

farm. I believe that consolidation of rural schools will solve this problem, and that when it comes to pass in Pennsylvania we shall see results in better country schools, and broadened opportunities for our young people, and such an uplift to the social life of the farm, as no other reform can bring to it."

At a meeting of the National Council of Education a few years ago in Denver, Colo., a committee famous in educational circles as "The Committee of Twelve on Rural Schools," was appointed to investigate and report on this subject. The committee was composed of leading educators, Hon. W. T. Harris, United States Commissioner of Education being a member. After a most thorough examination into the conditions of the rural schools of the United States, the committee, in a summary of a more exhaustive report, said: "One of the great hindrances to the improvement of the rural school lies in its isolation, and its inability to furnish the pupil that stimulative influence that comes from contact with others of his own age and advancement. The committee, therefore, recommends the collecting of pupils from small schools into larger, and paying from the public funds, for their transportation, believing that in this way, better teachers can be provided and more rational methods of instruction adopted, and at the same time the expense of the schools be materially lessened."

Prof. L. D. Harvey, of Wisconsin, while Supt. of Public Instruction in that State, made a more careful investigation of the consolidated plan, and his conclusions as published were, that the health of the children is better, they being less exposed to stormy weather, and avoid sitting in damp clothing. Attendance is from 50 to 150 per cent. greater, more regular and of longer continuance, and there is neither tardiness nor truancy. Pupils work in graded schools, and both teachers and pupils are under systematic and closer supervision. Pupils are in better schoolhouses, where there is better lighting, heating and ventilation, and more appliances of all kinds. Fewer teachers are required, so better teachers may be secured, and better wages paid. Better opportunity is offered for special work. Cost in nearly all cases is reduced. Pupils are benefited by a wider circle of acquaintance and the culture resulting therefrom. The whole community is drawn together. Public conveyances used for carrying children to school in the daytime may be used to transport their parents in the evenings, to public gatherings, lecture courses, musicals, etc. Finally, he says, by transportation, the farm becomes the ideal place to bring up children, enabling them to secure the advantages of centers of population, and spend their evenings and holiday time in the country, in contact with nature and plenty of work, instead of idly loafing about town.

I hope friends you will bear with me a little longer, while I quote from the University of Illinois Bulletin on this subject, issued last December. This bulletin was issued in response to a resolution adopted by the Farmers' Institute of Illinois requesting the Agricultural College of the University to collect and publish exact information relating to the methods, the difficulties, and the advantages of the consolidation of the country schools. Referring to what has been done the bulletin says: "From the various sources of information consulted, it appears that consolidation commenced in Massachusetts under the law of 1869, and was first operative in Quincy in 1874, since which time more than 65 per cent. of the townships have found it advantageous to consolidate some schools." In 1893, Supt. Rockwell wrote: "For eighteen years we have had the best attendance from transported children. No more sickness among them, and no accidents. The children like the plan exceedingly. We have saved the townships at least \$600 per year." From these and independent centers, the plan has spread until it is in operation to a greater or less extent in twenty states, not of a single section of the Union but of all sections. Among the conclusions arrived at are these:

At least one-third of the country schools are too small to be even fairly successful. The best teachers are taken for the graded schools, and of those available, for country schools from 50 to 75 per cent. are young girls with no more training than is given in the school they are to attempt to teach. As conditions exist to-day little children walk long distances, and suffer much discomfort and ill health by reason of exposure to storms, and from sitting all day with wet feet and damp clothing, after wading through snow drifts, slush and mud on the way to school. The only humane way of putting children of all ages and conditions into school, through all kinds of weather, is to transport them in wagons that are covered, and when necessary, warmed. Consolidation and transportation tend greatly to lessen expense, so that the same grade of schools can be had much cheaper, or a far better grade at the same expense, as patrons may desire, or if they please, a full equivalent of the best city schools may be established and conducted at slightly greater cost and at a much lower rate than in the city. As things are to-day, without consolidation, country people pay more for elementary instruction alone, than the city schools cost, including the high school course; but in addition, farmers pay vast sums for tuition and other expenses of their older children attending city schools for what is not offered at home. Consolidation is the only way of securing really good country schools and it is the only means of introducing the study of agriculture generally into our public schools. The objections offered in advance of trial are mostly either fanciful or selfish, and are not realized in

practice. Consolidation is the only plan tried or proposed, by which the country child can secure such an education, as modern conditions demand and such as is already afforded the city child. It lessens the expense and equalizes the cost; it protects the health and morals of the child and makes the introduction of the study of agriculture and other industries possible; it enhances the value of farm property as a whole; it brightens and broadens country life; it preserves its virility unimpaired and rationalizes the movement toward population centers. Such difficulties as are found, are trivial or transient or both and would not stand in the way of any commercial enterprise for a moment. Consolidation of country schools is the solution of the problem of agricultural education. *No school that has once tried it has ever gone back to the old way.*

In our neighboring State of Ohio, particularly in the Western Reserve district, consolidation has been tried, and is giving entire satisfaction. Speaking of the work in Ohio, Hon. O. E. Bradfute, former president of the State Farmers' Institute, in a recent interview said: "I do not think I can advocate too strongly the plan of the centralized school. It was not an easy thing to bring about this idea. There are many people in Ohio to-day who are afraid to tackle this question, but I can say with confidence that we now have a nucleus, especially up in the Western Reserve, from which we can work, and the idea is fast spreading all over the State. We have established enough, so that we know the schools are bound to be a success. I can truthfully say, that in Ohio we are beginning to regard centralization, as something like the measles—catching."

I sincerely hope, friends, that the germ or microbe, may be wafted across the border into Pennsylvania, and that every farmer in the State may become so inoculated with it, that an epidemic of consolidation will sweep over this entire Commonwealth very soon.

I have shown by the most reliable testimony that consolidation is proving all that its most enthusiastic advocates claimed it would accomplish, and what others can do, why not we of Pennsylvania? Is this grand old Keystone State, to lag behind in the march of educational progress? As Dr. Schaeffer in one of his reports well says: "Our American farmer should be made to realize that the public school is his very ark of safety, the bridge across which his little ones may reach place and power, and higher planes of usefulness. He should demand school advantages for his children equal at least to those of the city, that will equip them for a fair chance of success in the race of life."

The question that now presents itself is, What is the best method for the farmer to adopt to bring about this desired end? The answer is easily given. Simply agitate the subject of consolidation and elect

broad-minded, intelligent, progressive men—and women school directors. There are, and have been two potent influences tending to prevent the realization of the possibilities of our public school system. One is such a development of the public conscience, as allows school officers to subserve the interests of a political machine, and the other is the almost universal *man* management of our schools. If there is one thing more than another upon which our present day politics should not be permitted to lay its hand, it is our public schools. Its effect is ever baneful.

The second influence referred to, the ignoring of women in school offices, is depriving the State of the services of many of her most loyal citizens. Every one admits woman's interest in education. Even the most conservative will grant that the training of the young, is not only her privilege but her duty. You will say that women are largely employed as teachers. True, but why not give them a voice in the management of the schools. Then too, how many times, think you, would the young woman teacher be delighted, and her heart lifted of a heavy burden, if she could but consult a woman director in regard to matters which affect her pupils, but which her youthful modesty will not permit her to bring to the attention of a board composed entirely of men. The most important office in the whole school system is that of director. He is a power in his way, and he should be equipped with a liberal education, a knowledge of up-to-date educational methods, interest in the schools, and a belief in their possibilities, a knowledge of child-nature and sufficient leisure to devote to the various duties of the office. Few men, granting them all the other qualifications, know children as do women, or have such an appreciation of children's needs as is necessary in the ideal school director, while very many do not have the time to devote to looking after the welfare of the schools or to give them that thought which they demand. At the same time there are women of culture and experience in educational matters, in almost every community, ready and willing to serve their State in this way, but their services are not only not asked for but not accepted when offered, as has been demonstrated many times within recent years. But when we recall that school directors are elected by men and that the office is very widely considered the lawful prey of the politician—the earnest of greater political favors—it is no wonder the advocates of woman suffrage tell us that nothing short of franchise in the hands of women, can bring about this necessary reform. However, I am not yet an avowed woman suffragist, and believe that when the attention of the voters is called to this matter they will see the error of their way, will see the mistake they have been making, in thus ignoring women. But if they do not, and will continue to be so selfish in

this matter, I will heartily favor an act making it obligatory upon them to elect and keep on every board of school control a certain number of women. The law making them eligible to the position should have thus provided for their election. I trust, friends, that you will pardon this seeming digression from my subject, for I assure you it has a more important bearing upon it.

The consolidation of rural schools is a matter that should call for more universal co-operation among the men and women of the farm. No other question has larger meaning to the future of the young folks than this. Shall the farm boy and girl be deprived of the school advantages so freely offered their city brethren? This is the question for you fathers and mothers to answer. There are, however, honest differences of opinion in regard to nearly all public measures. Our common school system began its great work amid strenuous opposition from mistaken men, who little dreamed of the great good to be accomplished through its instrumentality. They saw not the wise policy kept in view by the supporters of the system. But little by little the work of the system began to speak for itself, and so it is with consolidation, it is speaking for itself. It is past the experimental stage, and all true friends of education, and of the country children, should stand together in a spirit of liberality and broad-mindedness and do every thing possible with an eye single to the best interests of the rural schools. This is an age of progress. We cannot, we must not stand perfectly still, nor should we rest until the rural schools of Pennsylvania are equal if not better than any in the United States. And, friends, only by consolidation, as I see it, can this be accomplished, for then our schools will be graded and the children will pass up through the primary, the intermediate and grammar grades, into the high school, and to the curriculum of the rural schools of to-day, will be added Nature study, domestic science, manual training, music, drawing, etc.

And what of the township high school? Not one of us, I fear realize its importance, the untold benefit and advantages it would bring to our boys and girls. Dr. Harris, whom I have already quoted, in comparing the chances of a boy with only a common school education, and the graduates of a high school, tell us, that the chances of success of the one with a common school education, in round numbers, is one chance in 9,000, while the boy graduated from the high school has one chance in 400, increasing his chances 22 times. Now friends do we not want to give our children all the chances for success possible? Are the children of the city to be given opportunities denied the children of the country? "Equal opportunities for all, special privileges for none" should be our watchword in this

campaign for better rural schools. By consolidation, enough money will be saved each township, according to reliable statistics, to almost, if not altogether meet the expenses of the high school. But if another mill or two should be added to your school tax the first year or two, for building purposes what of that? You cannot give an extra dollar or two, or five, for a better purpose.

In closing, I am going to ask you all, friends and co-workers in the field of agriculture gathered here from every section of this great State, to resolve to-night, here in the land of Penn, and almost under the shadow of Independence Hall, to do all you possibly can to bring about this glorious day for the farm children of Pennsylvania. A heavy responsibility rests upon you in this matter. You should not, oh, you must not, open the golden gate of the future for our boys and girls, with the old rusty keys of the past, but advance the standard of the rural schools onward and upward, keeping step with the march of intellectual progress in this 20th century, and stop not until you have placed it on the high ground of consolidation. For the children of the farm I plead.

The CHAIR: We will now be entertained with a vocal solo by Mr. Clayton.

Mr. Lewis Clayton, of Fox Croft Grange sang "The Land o' the Leal," which was received with warm applause. The audience was so well pleased that a second selection was insisted upon and courteously granted. He was accompanied by Miss Irwin.

The CHAIR: The next thing in order will be an address by Prof. John Hamilton, of the Department of Agriculture, Washington, D. C., entitled, "The Farmers' Institutes—Their Value and Place in Public Education."

Prof. Hamilton opened his address by speaking in strong terms of approval of the paper read by Mrs. Mary A. Wallace, and stated that it was a question that lay at the bottom, or that was fundamental as related to our common schools.

Prof. Hamilton's address is as follows:

FARMERS' INSTITUTES, THEIR VALUE AND THEIR PLACE IN PUBLIC EDUCATION.

BY PROF. JOHN HAMILTON, *Farmers' Institute, Specialist, Washington, D. C.*

I wish at the outset to make the assertion that the State has not done its whole duty to its citizens until it has made provision for the educational development of the entire population. Has offered education sufficient in extent, and of such a character, as will enable

every adult, of good health and sound mind, to be self-supporting. He shall not only be self-supporting, but have sufficient reserve earning power to enable him to provide, in addition to his own support, for the maintenance of at least two others, who are unable to maintain themselves.

We are accustomed to think of education for the public as being solely for children and youth. Accordingly in most of our States the school age is limited by law to the period between five and eighteen years for the common schools.

The great body of this work should be done in the public schools while the pupils are young, but when this has been neglected, as is the case all over the United States, to-day, then it should be extended to the adult worker outside wherever it can possibly be done.

PUBLIC EDUCATION.

By "Public Education" is understood education at the public expense. A not inconsiderable portion of our citizens maintain that the public is not justified in adding to its tax by supporting the higher institutions of learning such as the high schools, academies and colleges. They hold that expenditure by the public for education should be limited to the cost of giving elementary instruction, including only the necessary branches of reading, writing, arithmetic, geography and English grammar, with perhaps a little physiology and history. These conservative citizens also declare that taxation, for education in the common schools, is only justified on the ground that some educational training is necessary in order to fit men for citizenship, and that the elementary branches just enumerated are all that are necessary in order to effect this. That when these are offered the public has done its full duty to the individual and to the State.

Progressive educators, on the other hand, hold that fitness for citizenship is not complete when men have simply learned how to read and write, and interpret the Constitution of the United States, qualifications enabling them to vote, but that it embraces also the additional training necessary in order that they may be self-supporting. In other words, that the object for which the school is established is not accomplished, until it has taught the individual how to make a living for himself, and to support at least two other helpless persons dependent upon each wage earner for food, raiment, shelter and education.

If the latter interpretation is correct, then Public Education is for not simply the few who are in the public schools, but extends to the entire body of our people and it is not confined to a meager list of elementary studies, but includes those that belong to a liberal course,

embracing many practical subjects as well. The purpose is to fit the students for becoming productive members of the State.

The National Government has defined its position on this subject, at least so far as relates to agriculture and the mechanic arts, by establishing in the several states, from the public funds, colleges for the higher education of the people, and by endowing experiment stations, for conducting scientific investigations in agriculture, in maintaining the National Department of Agriculture at Washington, and in distributing to the public the information which these institutions collect. The principle, therefore, that it is proper to appropriate public money for education, outside of that given for the support of the old time common or public school, is recognized by highest authority.

COUNTRY CHILDREN.

The last census gives the total number of children in the United States, between five and eighteen years, at 21,404,322, out of a total population of 76,303,387. There are in the country 5,700,341 farm homes. The average number of occupants for each home, is given at four and six-tenths (4.6) persons. This makes the total agricultural population of the country, living in farm homes, about 26,221,568, or thirty-four and thirty-six hundredths (34.36) per cent. of the entire population. The proportion of children to the total population is, therefore, twenty-eight (28) per cent. Carrying this same proportion into the calculation of the number between the ages of five and eighteen years in farm homes, we have a total of 7,342,039 children of school age belonging to the farm families of the United States, which leaves as the number of adults in farm homes 18,879,529. These last are all out of school excepting the few that are in the academies and colleges.

ORGANIZATION OF THE INSTITUTE.

For those who are engaged in agriculture, the Farmers' Institute has been organized. It is a school, not an entertainment or minstrel show, or an arena for clowns to display their antics, but a school of practical science of high grade. A school in which are gathered the working farmers, housewives and farmers children, for the study of the problems that confront them in the prosecution of their art.

The Institute undertakes to instruct these farmers, by having such facts, relating to agriculture, as have been discovered and demonstrated to be most valuable for their use, presented and explained, and by showing how these discoveries of science may be applied to the improvement of the farmers' methods so as to enable him to increase his product with the least effort and expense.

It differs from the ordinary public school, as well as from the normal school and college, in that it does not take up the systematic and exhaustive study of the topic which it undertakes to teach, but merely calls attention to the valuable features which the subject contains, and then refers the scholar to reliable publications, or other sources of information, for the more full, complete and itemized verification of the facts. The Institute is not intended to satisfy, but rather to excite, and stimulate inquiry. To raise questions in the working farmer's mind that will give him no rest until he shall have investigated them for himself, and has proven to his own satisfaction by actual demonstration in the field, the truth or falsity of that which he has been called upon to adopt. The purpose of the Institute is to cause the farmer to think. To think for himself, rather than to accept, without question, that which others assert as being gospel truth.

VALUE OF THE INSTITUTE.

The value of the Farmers' Institutes has been fully demonstrated. They started from small beginnings, and have been developed within the past twenty years, until last year they were held in all of the states except two, and in all of the territories except Alaska and Porto Rico, and they reached almost a million of the farming people of this country. They had in their employ 900 lecturers, many of whom are among the most capable scientists in the land. The Institutes were organized to meet a demand on the part of the agricultural people for information. So long as our soil was new and consequently fertile, rural life inexpensive and simple, labor plenty and cheap, land to be had for a dollar or two per acre, insect enemies almost unknown, crops abundant, luxuriant pasture to be had at almost no cost to the owner of the stock, so long as these conditions prevailed, the need for information in regard to agriculture was not felt. Any one could farm.

CHANGE IN FARM CONDITIONS.

All this has been changed. Good land is no longer cheap; soils are no longer virgin; labor is no longer abundant; life is no longer simple; the purchasing public are no longer indifferent to the quality and appearance of our products. We have begun to realize the fact that we do not understand our business, at least not sufficiently so, as to successfully meet the changed conditions. Men have been, and still are, anxiously inquiring what they must do to be saved from the sheriff's hammer, how they shall restore their impoverished soil, how they shall select their seed, what crops they shall cultivate, what breeds of animals they shall rear, what fertilizers they

shall use, how the scarcity and increased cost of farm labor shall be met, how insect enemies shall be controlled, how fungus growths shall be overcome, how our animals shall be protected against the disease germs that abound on every hand and threaten the destruction of our herds, what we shall do to secure moisture for our crops, and where profitable markets can be found? These and many other questions, equally pressing and important, have come to distress the modern tiller of the soil, and now the man who once had no anxiety or care with respect to his ability to gain a livelihood from his farm, is most seriously concerned as to what he shall do to insure certain and profitable crops from his rapidly deteriorating fields. Many, some years ago, became desperate in their sense of helplessness and inability to cope with the difficulties that surrounded them. Not a few permitted themselves to be led by ignorant and loud demagogues into many foolish and ill-considered ways, in the hope of some relief, would speedily be found either in politics or in greenbacks, or silver or gold. Like persons who are desperately sick, they were willing to try any nostrum which any irresponsible charlatan might suggest. Like drowning men, they clutched at any support, even a straw, in the hope that it would sustain them until some one appeared to rescue them from their peril.

WHAT THE INSTITUTE DOES.

The Farmers' Institute has come. It throws out life buoys to these sinking men in the shape of valuable information which they can seize and use. Some are laying hold on it and gradually it is aiding them to regain the solid ground.

What does the Institute do for a man? It teaches the farmer how to discover the unprofitable cow; how to furnish a cheap and well-adjusted ration, adapted to the securing of the particular product which he desires. The Institute teaches him what to plant, and how, and when and why, how to plow and how to cultivate his soil, the reason for every operation, and the purpose that it is intended to subserve. It teaches him how to preserve his crops, how to market them in good condition so as to bring the highest price, how, most economically, to fertilize his fields, so as to cause them to produce larger crops year after year, and steadily improve. It shows him how to subdue the insect pests that threaten to destroy his fruit and grain; how to breed his cows for milk, or butter, or cheese; his sheep for wool or mutton; his horses for draft or speed; his swine for bacon, or lard, or ham; his poultry for eggs, or meat, or both. In short, it comes to the man in need, and cheers him up with hope by teaching him the secrets of his art. It instills courage into his heart, strength into his arm, brings joy into his life because

he now sees the demon of debt gradually disappearing, and comfort and prosperity abiding in his home. The Institute does this, or that which the Institute brings to him enables him to do all this, and its influence sends him forth to his work with higher aspirations, nobler purposes, and a firm determination to succeed.

The Institute causes him also to respect his calling. Too many farmers have despised and hated their occupation instead of loving and cherishing it. The Institute presents agriculture in its true attire as one of the learned professions, noble, profitable and independent. Causes him to appreciate its worth, and induces him to commend it to his children, for a life pursuit. It is valuable to him, because it brings him knowledge. A kind of knowledge that he specially needs, that he can use and that he can get nowhere else. Knowledge that emancipates him from fear, that releases him from the helplessness that ignorance of his art has caused. He is no longer a slave to a dull, uninteresting and unprofitable pursuit, but he is a free man, wide awake, confident, able to cope with the world and again to stand independent among men.

THE INSTITUTE AND THE STATE.

The Institute is also valuable to the State. The welfare and perpetuity of the State, is directly dependent upon the intelligence and prosperity of the farming population. This declaration is so manifestly true as to need no proof. Every public man whose opinion is worth quoting, and who has declared himself on the question, has unqualifiedly endorsed this truth.

The natural tendency of men is to fall into a rut or mechanical routine. A man perhaps has carefully thought out a course of action, has started successfully in life, and hopes, by continuing the same methods which he has adopted, to continue to succeed. Too frequently this over-confidence results in his ceasing to study his occupation, and to keep informed as to the new methods, and the new conditions which may arise and which affect his business. He forgets, that "eternal vigilance" is the price of success in agriculture, as well as in politics, and by neglecting this sound maxim he gradually loses ground in the agricultural race.

The Institute comes and wakes this individual up, opens to him new lines of thought, suggests improved methods in practice, warns him against dangers, stimulates his intellectual faculties, and fills him with ideas sufficient to occupy his waking hours. He puts some of his thinking into his crops, some into stock, implements, fertilizers, family, country roads, rural schools and as his thinking develops into fruit, it is seen by others, and his example sets his neighbor likewise at work. He becomes a factor in his local government.

His influence extends into the legislation that is to control the country, and when this occurs he is unaffected by the temptations of public life that cause many city men to fall. The necessity for money with which to live, and the inordinate desire for holding office as a means of living, do not control his vote. He can live without the office. He regards public service as a duty which he assumes as any other, and relinquishes as soon as the need for his service is past.

RURAL POPULATION, SAFEGUARD FOR THE STATE.

In all history there is no record of the country population causing the destruction of the nation through the practice of the vices that enervate mankind, or the crimes that render life and property insecure. States have always been destroyed by their cities. These gradually absorb the country, and being compact, and having no interests excepting those of self, they grow narrow in thought, low in ideals, and corrupt in administration, until like Sodom and Gomorrah, their sin becomes unbearable, and they are destroyed in much the same way as those corrupt cities of the Plain, by a destruction overwhelming and complete. Babylon, Jerusalem, Nineveh, Carthage, Rome, Athens, Tyre, Memphis, Ephesus, Troy and Corinth, one fate befell them all, and the causes of their overthrow were alike—a city population, with a country given over to a peasantry too ignorant to govern, and too indifferent to care. Should this country be guilty of like disregard of the interests of her rural population, a like end will unquestionably result.

The remedy for all of the ills which befell the ancient countries and caused their final overthrow, lies in the proper education of the rural people. Make the country habitable, by making agriculture a profitable and interesting occupation, so that those who love their family in preference to the club, will continue in sufficient number to shape our religious life, and control the political future of the State.

An industry with 26,000,000 of people in its employ, and of this almost 19,000,000, or 72 per cent., out of school and having practically no organized system of instruction in the mysteries of their art, has been the situation until within the past twenty years. The Institute school has come to carry to this vast body of our workers, and to others who ought to join their ranks, the knowledge that science has discovered relating to their calling, and the practice that experience has shown to be the most valuable for their use.

Into this vast field of agricultural education the Institute worker has entered with his limited supply of help in the hope that as time goes on, more laborers, and better equipped, may be found to assist

in the important work of disseminating scientific information and thereby increasing the productive power of agricultural people everywhere throughout the United States, in the hope that many more may be willing to aid in rendering this calling so attractive in its surroundings and profitable as a pursuit, as to become the paramount desire of every man and woman that desires to live a comfortable and independent life.

THE INSTITUTE OF RECENT ORIGIN.

I have said that this is an educational institution of quite recent origin having come into the educational field only about twenty years ago. The fact is that it has only been recognized as being entitled to a place among the educational institutions of the country within the last ten years, and even yet its lack of system and its variety in method of carrying on the work show that it still is in its formative stage, and will require years of experience and careful guidance before it will assume the full, compact, controllable and effective form which it must become before it will take its true place among the great educational organizations of modern times.

FARMERS' INSTITUTE SPECIALIST.

To aid in effecting this organization, and consolidation of work, the Congress of the United States recently created an office in the office of Experiment Stations in the Department of Agriculture, called Farmers' Institute Specialist. The purpose is to gather statistics with regard to the work of the Farmers' Institutes in the several states, and publish them for the information of the workers throughout the country; to study the problems that the Institute Director has to meet, and suggest such improvements in methods and changes in plan as will be of service in perfecting the system and aid in bringing about a common understanding as to the course that ought to be pursued in order to secure the best results.

This new office hopes to aid the Institute Directors by sending out expert scientists from the Department from time to time to give instruction along the lines of the latest discoveries of science, as they relate to agriculture, to place these Directors in communication with the Institute lecturers of the country, and to aid in educating a force of lecturers by means of literature and correspondence, and by bringing them into communication with experts who can give them instruction in their several specialties. The office can become a kind of clearing house in Institute work, and be a common center of reference for information and advice.

THE LAND GRANT COLLEGE.

In order that the place which the Farmers' Institute occupies in the system of public education may be more clearly defined, I wish to call your attention to the movement for the education of our industrial population which began in 1862 when the Congress of the United States appropriated public lands to the several states for the establishing of colleges which should teach agriculture and the mechanic arts. The statistical reports of these colleges for the year ending June 30, 1904, show that sixty-five institutions have been established from the proceeds of the sales of the public lands, and that sixty-three offer courses of instruction in agriculture. They represent an investment of about \$72,000,000 (\$72,540,588.11), and had a total income that year of over \$11,000,000 (\$11,498,341.45).

The number of persons in their faculties of agriculture and mechanic arts was 2,740. The total number of students in these institutions in all courses was 56,226, of which 15,641 were students in agriculture, or its allied courses.

There were 4,822 graduates in 1904, and up to that time almost 58,000 (57,909) had taken degrees in these colleges since their organization in 1862. Many of these students went into other occupations and professions, so that agriculture received but a comparatively small proportion of the total that the land grant colleges have graduated. Many others, however, who attended these institutions, and for various reasons were prevented from completing their college course, nevertheless were greatly benefited by their attendance, and have since gone into agriculture and pursued it with marked success.

Although some work for the education of farming people in the line of their specialty had been undertaken at earlier dates, yet it was of a fragmentary and disconnected character. The act of Congress of 1862 was practically the beginning of higher technical education in agriculture in the United States. Forty-three years have elapsed since the act passed, and yet these colleges could scarcely be said to have settled down to a well organized and clearly defined system of work until within the past twenty years.

For the first twenty years they had to struggle for existence, and during most of that period were scarcely recognized by the older institutions of learning as being worthy of the name of college, but were regarded as of a rather inferior grade of manual school. Now, however, they stand in the front rank of the educational institutions of the country, and are rapidly taking the lead in scientific progress of the older colleges and universities that not long ago regarded them with contempt.

THE AGRICULTURAL EXPERIMENT STATION.

The next great educational movement in agriculture in this country was introduced just twenty-five years after the establishment of the land grant colleges. I refer to the Agricultural Experiment Stations which were organized by act of Congress of March 2, 1887. Sixty of these institutions are now established, and almost 800 (795) persons are employed in them in the work of administration and research.

Although they have been established only eighteen years, and many of them more recently, their history and work are among the most marvelous of the achievements of this wonderful age. Discovery after discovery has marked their way until the most of that which we as agricultural people have found most valuable in our profession, has been discovered and prepared for us by the scientific men that these Stations have had in their employ. Their bulletins and reports are the most valuable contributions to agricultural science of any other publications in the world. Congress gave them each but \$15,000 per year for carrying on their work. Two or three times this amount ought to be at their disposal at once if they are to be of the greatest service, and furnish to agriculture the information which, if adequately equipped, they could easily supply.

THE NATURAL DEPARTMENT OF AGRICULTURE.

The month of July, 1862, will go down to history as marking the introduction into modern agricultural education of another force that has grown to proportions that are not equalled by any similar institution in the world. I refer to the great Department of Agriculture at Washington. In September, 1861, what is now the Department of Agriculture for the United States, was a small subordinate division in the Department of the Interior, consisting of about nine persons, and having almost no money with which to work. On the 15th of May, 1862, Congress passed an act creating a Department of Agriculture, and on July 1, 1862, the act went into effect and this new organization began its life. It has progressed and developed from a minor place among the Departments of the National Government to pre-eminence. From a Commissioner in charge and an appropriation of \$60,000 per year, to a cabinet officer with a present force of 5,134 men, of whom over 2,100 are scientists, scientific investigators and their assistants, with an appropriation in 1905 of almost seven millions of dollars (\$6,882,690) for its support.

THE WORK OF THE NATIONAL DEPARTMENT OF AGRICULTURE.

It has become the great agricultural university of America, of the world, carrying its investigations into every land, and directing its attention to every subject that promises to assist agricultural people to a better understanding of their profession, and is bringing from all lands plants, animals and methods, with the view of testing their qualities and adaptation to the soil, climate and other conditions of the United States.

Soils, plants, animals, climate, foods, roads, fertilizers, insects fungus diseases, educational problems, nutrition studies, irrigation, forestry, statistics and the editing and publishing of the results are some of the more general lines of investigation which the Department has in hand. All of these are subdivided in almost infinite detail, and are worked out in the laboratory and in the field with the most intelligent and painstaking care until the truth has been discovered, upon which the results are published and distributed freely to the world.

No agricultural people outside of this country are so highly favored, educationally, by their Government as the farmers of the United States. Colleges that are foremost in the land, Experiment Stations not equalled in the world, a National Department of Agriculture such as has just been described, comprise a system of education in agriculture of which any people may be proud.

AGRICULTURAL LITERATURE.

It has been found, however, that notwithstanding the vast amount of valuable literature which these institutions are yearly securing and sending out, and the efforts of the public press to disseminate the truths which the colleges, the stations and the Department have discovered, that the average farmer, not to speak of those who are below the average, fails to avail himself of the advantages which these publications present. In short, it has been found that farmers as a class do not read except the family Bible, the weekly markets, and, in times of great excitement, an occasional speech by the political representative of the particular party to which they themselves belong. They become physically tired after the exertion of the day, and "early to bed and early to rise" leaves little time for else but the labor of the farm.

The realization of this fact has come only within the past few years. The problem, therefore, at once arose how shall this knowledge that these institutions have gained at so much cost of both money, time and diligent research, be brought to the attention of the men who do not read, and yet who need the very teaching which this information gives.

INSTITUTE SUPPLY A NEED.

In response to this, the latest great educational movement in the interest of agriculture, the Farmers' Institute was organized, and is now sent out all over the land with its skilled teachers and trained speakers, going to the people in every hamlet, meeting them direct face to face, carrying to them the truth which they so much need. The Institute is going out as the great distributing agency of the colleges, stations and National Department of Agriculture of the United States, to disseminate far and wide the knowledge they possess. No more effective agency for the uplifting of agriculture has ever been devised. What it will do in future years, it is impossible to predict. That it will gradually come into contact with all of our people seems now to be assured, and that it will mold the character of rural life, and change the crude education which country children now receive into that of the most advanced of any in the town and city schools, are to many of us, at least two of the valuable results which these Farmers' Institutes are destined to secure.

They were organized to supply a need. They found a vacant place in our system of public education, and have undertaken to meet the want. They are engaging as teachers in this school the most capable, practical and scientific men and women that the country has, until now, as has been stated, over 950 of these teachers are regularly employed, and many thousands of others are occasionally engaged as the needs of the work in the several localities demand.

The Institute is the greatest agricultural university of the United States into which about one million of our people have already come, and under whose influence we hope to gather the almost thirty millions of other citizens that compose the agricultural population of these United States.

With this great force constantly at work, and with yearly increasing power, the outlook for agriculture in the United States is bright with hope, and all that is needed to complete our salvation as agricultural people is that we ourselves shall join hands in aiding and in encouraging these unselfish and valuable institutions, demanding that they shall have local, State and National support sufficient for their work until agricultural education in its highest and most beneficent sense has become the possession of every man, woman and child, capable of receiving it, to the remotest districts of our land.

The CHAIR: We will now be entertained with a whistling solo by Miss May Stewart Smith.

Miss Smith rendered very sweetly, "Every Morn I Bring Thee Violets," and as an encore, "The Last Rose of Summer."

The CHAIR: The next number on the program is, "Advantages to be Derived from the Centralization of Township Schools," by Prof. Samuel B. Bayle, Superintendent of Erie county public schools, Fairview, Pa.

In introducing Prof. Bayle, the Chairman stated that he had the distinguished honor of being the first man to establish the centralization of township schools, and that he now has the supervision of more schools and teachers teaching agriculture to farmers' boys and girls of his own township than anyone else.

ADVANTAGES TO BE DERIVED FROM THE CENTRALIZED AND TOWNSHIP SCHOOLS.

BY PROF. SAMUEL B. BAYLE, *Superintendent of Public Schools, Erie County, Fairview, Pa.*

Mr. Chairman, Ladies and Gentlemen: In this beautiful valley of Chester, we are learning a lesson from one of the greatest farmers in our land, instructive to us as we go over that beautiful road bordering on great historic places; and then these excellent speeches to-night that reached deep into truth and unfolded it beautifully to our view. Now isn't it about time for us to quit and go to bed? In fact, I think if I were you and in your place, I would simply say, "good evening" and go; but ladies and gentlemen, as I look you in the face I come to the conclusion that I am talking nearly to the whole State of Pennsylvania, the grandest of Commonwealths, rich in her hills and her mountains, with wealth teeming forth from her valleys, with her great manufacturing interests and her immense mines of coal that extend from mountain to mountain, giving the world a chance to live. I am proud that I am a Pennsylvanian as I look out upon the blue waters of our own Lake Erie; I am proud that I am a Pennsylvanian as I look at the waters of the Delaware as they empty into old ocean; proud that I am a Pennsylvanian as I go through your Quaker city and behold its greatness, also the beautiful city of the northwest, our own Erie; proud of our public school system that gives to the boys and girls of our great Commonwealth a chance to live, that develops your sons and daughters and my sons and daughters, and makes them citizens of this old Keystone State of ours, along with the other great revolutions and developments that have aided so much in our progress, there is none that has been more important or more wonderful than the progress of our public schools.

Have you ever stopped to think of the progress of the last century? Why, ladies and gentlemen, just about a hundred years ago—you would not think it to look at my wife—just about a hundred years ago she and I rode up from Lancaster county over the hills and mountains and through the valleys with a six-horse team into the then new and crude territory of Erie county. Of course we were with our grandsires, and night before last we got on a train, took a Pullman, and waked up the next morning in the city of Philadelphia, crossed the State from end to end in a single night, hitched to the chariot of steam, while in the time of my grandfather, we made our slow progress behind a six-horse team. Such has been the grand and steady march of development in our land. So in regard to our public school system; every middle-aged man and woman will remember when we started in to school. You who are farmer boys will well remember that you started in to school somewhere after the fall work was done, and we sometimes trudged miles to the little old schoolhouse and sat on the rude benches of the time, and we opened the old arithmetic just where we had opened it the year before, marked with the thumb-marks and the dog's ears that indicated our efforts to master its lessons. We were submitted to the same tests in that old arithmetic until it sometimes seemed to us that it had neither beginning nor end. Just reflect for a moment what progress has marked the development of our system of public instruction, our common school system since those earlier days. How the gulf has been narrowed and the chasm been bridged and the difficulties smoothed away until now we have in our school system here in Pennsylvania a course of instruction and methods of which we may all well be proud.

Prof. Bayle then spoke of the necessity of divorcing the management of our schools from politics and of the necessity of keeping the power and authority over our schools in the hands of the people, and of the great benefits to be derived from the township high schools, and urged upon those present that they give their hearty support to the movement now inaugurated to provide for a course of agricultural instruction in our public schools, so that our farmers' boys and girls may be better equipped for the work of the farm, and so that their understanding and interest in agricultural affairs may be cultivated and developed to such an extent that they may not think it a hardship but rather a pleasure to remain on the farm, and to take up the work of the farmer, the greatest and noblest work in all the land.

The Professor said that one of the most important considerations of to-day's educational problem is that of centralization. He asserted that by this means our schools would be much improved; that

nearly every teacher would be able to do better work with a room full of pupils than he could possibly do when there were only half a dozen or a dozen present at roll-call. He said there was a great stimulus in numbers, and the pupils in a large school will always be able to do far better work than those in a small one.

He then took up the question of economy in school management and support, as related to the consolidation advocated. He said that the taxpayer's interest would be subserved by centralization, that the consolidated township school would prove to be far cheaper than the maintenance of two or three or more ungraded schools while the greater advantages which the children would receive through centralization would of itself be a sufficient motive to warrant the adoption of this method.

The Professor cited an instance of a dull boy, who, by patience and careful study of his mental organization and ability and temperament, had been aroused to intelligence and industry, and all because the township high school had afforded him an opportunity to study a subject which appealed to him.

He said that the advanced studies provided for in the township high school ought to be supplemented by practical and useful studies so that our daughters may learn to be good cooks, and our sons ought to be instructed along lines that would lay the foundation for their becoming good farmers, as well as generally intelligent men and women.

The Professor paid a high tribute to the women of Pennsylvania and expressed his regret that more of them are not represented on the school boards of the various counties.

The Professor advocated the provision in all the primary grades not only for concentration and strengthening all along the line, but also the introduction of nature study, and instruction particularly with reference to flowers and birds. He said in the next four years let us go a little further in this direction and give our pupils more insight into the mysteries of nature, and also give them more time to apply to the great subject of agriculture. Let us have the strength of the old district school and the proposed new methods combined, the one side by side with the other where the rich and the poor will have the same opportunities and be brought together under conditions fitted to develop them into noble and intelligent men and women. Do not neglect to instruct them in the history of the old flag. Let them look down upon the grave of Benjamin Franklin; teach them the history of Pennsylvania and the story of its great men; teach them to rejoice in the liberty that we enjoy; let them look upon old Independence Hall, and weave into their minds a knowledge of the glories of our great Keystone State.

Let us stand by these schools. Let us build them up and strengthen them and support them, so that the future of our great Commonwealth will be even greater than the past, and greater than the present.

Adjourned until to-morrow morning at 9 o'clock.

Memorial Hall, West Chester, Pa.,
Thursday, 9 A. M., May 25, 1905.

Watson T. Davis, of Ivyland, Pa., in the Chair.

The meeting was called to order at 9 o'clock.

The CHAIR: The first number on the program is "Methods of Institute Work," by Mr. M. S. McDowell, State College.

Mr. McDowell's paper is as follows:

METHODS OF INSTITUTE WORK.

BY M. S. McDOWELL, *State College, Pa.*

It is with diffidence that I approach the subject which has been assigned me by the Director of Farmers' Institutes. The discussion of this question may seemingly place me in the position of a critic, but such an attitude I do not wish to be understood as assuming. I fully appreciate the difficulties which confront the institute worker in the presentation of his subject matter and I also appreciate the fact that "Those who live in glass houses should not throw stones." What may be said is not in any manner to be construed as criticism of any individual engaged in institute work. I shall endeavor, in the few minutes at our disposal, to speak of a few things which have appealed to me as a result of seven or eight seasons' experience and observation in farmers' institute work.

We have passed the day when it was believed that farming did not require special preparation and a high degree of intelligence and that no scientific problems were involved.

The great industries of the country have passed or are passing through a transformation and their operations are or are coming to be based largely upon a knowledge of the scientific principles underlying. This does not mean that the men who operate the great mills and factories are scientists but it does mean that they are taking advantage of the practical application of the developments of the scientist. In this connection we should be careful

to make the distinction between a science and an art. This is desirable because of the tendency to confuse these two things and because agriculture should be dealt with as an art and not as a science. A science deals only with the relations of cause and effect within its own field. Its sole single concern is to trace effects back to their causes; to project causes forward to their effects. An art, on the other hand, starts with the assumption that a certain thing is desirable or that a certain other thing is undesirable; that something is good or that something is an evil. The object it seeks is to ascertain how the good may be attained, or the evil avoided.

In pursuing this inquiry, it makes use of the principles, or laws, governing the relations of cause and effect, which have been ascertained in the cultivation of all the sciences that have in anyway to do with its own subject matter.

Agriculture then is an art and, as in the practice of any art, we seek to apply the largest and latest results of the various sciences, as chemistry, bacteriology, botany, etc.

In our institute work it seems to me desirable that in presenting many topics the principle involved be emphasized as far as possible and that we, in addition to outlining methods, endeavor to impress the fact that a proper understanding of the principles is more likely to bring success than an attempt to follow the course as may have been mapped out during the discussion. It is often necessary to reach the principle through the use of detailed method in order to make it stand out clear. To illustrate, we all will agree, I think, that the presence of humus or vegetable matter is one of the most important factors in restoring a so-called worn out soil. We may be told that the clovers, cowpeas, etc., are the best things that can be grown for this purpose, all of which may be quite true. But in some cases the absence of the very thing we are after may be the cause of the inability of clover to grow. It may be desirable, therefore, to use some other plant for a time at least. In other words, it may be necessary to use different crops in different cases, but yet the principle involved is the same, i. e., that the presence of humus is necessary. Emphasize the principle and then suggest as to method.

A fact which is often true and yet not always apparent is, that often we emphasize a particular thing independently of correlated facts and as a result some one may be led into an error which, while we may not be directly, yet we are indirectly responsible for. It is proper and necessary that in discussing a topic we stick as closely as possible to the text and impress the particular points connected with our subject; but in that very fact lies the danger. There are doubtless other conditions which are as important and necessary as the one we are trying to emphasize. Many auditors

not realizing this fact may assume that the one thing which they need to bring them out of their troubles and place them on the easy road to success is the condition upon which the speaker has dwelt and that this condition or effect may be secured by methods which have been outlined by him.

To illustrate: Fruit growing is necessary and as we advance, new pests appear and multiply rapidly. It is necessary to recognize this fact, and spraying has been resorted to as a means of controlling the condition which prevent the ravages of many of these things. A knowledge of how to spray intelligently is a necessity in orcharding. It is something that needs to be taught. When the subject of spraying is under consideration it is desirable to confine attention to this one thing. Now there are perhaps many people whose orchards are unproductive. The suggestion of spraying is new to them. They grasp it as the means of securing productiveness and fail, not because spraying is ineffective, but because they failed to appreciate that proper fertilization, cultivation, pruning, selection of stock, etc., are all matters of primary importance. All these things must work together to bring about the desired result and satisfactory results from spraying can not be expected unless the other conditions are what they should be. It is sometimes well to make these facts clear. In this same connection extravagant statement is to be avoided. While enthusiasm may lead us to speak in glowing terms of certain things, great care should be exercised that our enthusiasm be not allowed to outrun the truth. Too extravagant statement is likely to weaken whatever of truth and helpfulness may have been contained in our discussion. Another matter which it seems well to bear in mind is that we cannot be too careful in our statements. We cannot make them too plain; but the reverse may easily occur. Discussion over a particular point in an institute is very often due to a misunderstanding of the positions assumed by the opponents. Much of the trouble which occurs in this world is due to misunderstandings and it is well to avoid them in the institute. Very often an apparent difference of opinion has no foundation in fact, but is due to the different view point from which individuals regard the facts. It is well for the reputation of the institutes themselves, for the good of the particular institute and in justice to the speaker himself, that he get as far as possible the point of view of those who may differ from him. By so doing it may often be possible to bring out the cause of failures in certain directions.

At a certain institute, the question was asked as to a remedy for San José Scale. There did not happen to be any one present who discussed fruit and the various phases of fruit growing, but one of the members of the institute force answered the question by saying: "That while he was not engaged in fruit growing and made no

pretense in discussing a question of that character, he had heard practical fruit growers discuss it and had read somewhat of the experiments that had been made in this particular field, and the consensus of opinion with these people was that the proper use of the lime, sulphur and salt wash was the most practical method of combating this pest."

Immediately some one in the audience arose and made the statement that lime, sulphur and salt was absolutely without effect and that the only thing to do was to cut the trees down and burn them—a pretty expensive and discouraging course to pursue. The question immediately drifted into a discussion or rather statements pro and con and the effect that "So and So has used it and it will do the work," and on the other hand, "I know from my own experience it will not."

Those who are using the lime, sulphur and salt spray take pains in its preparation, use the best possible means of applying the spray and use it at a time and on trees where it has a fair chance to accomplish results. According to my understanding, if it is improperly made, improperly applied or used on trees which have become so effected that they are already practically dead, satisfactory results can not be expected.

The physician is very often able, through proper treatment, to save the lives of those who are dangerously ill, but beyond a certain point the physician can not go. If his remedies are carelessly and improperly prepared and administered or applied in the same way, little can be accomplished, nor can the physician revive one already dead or dying. The same principle applies with equal force to the vegetable kingdom. If all these things can be made plain it may enable those who have failed to see why they have done so. It is by bringing out these facts that the institute can accomplish the greatest amount of good. It is desirable to avoid misleading statements. There is probably no one subject upon which there is a greater divergence of opinion than upon the question of lime. We know too that those who advocate either the one side or the other of this question are perfectly sincere and probably right for their own conditions. A statement to the effect that "lime is good to whitewash with," does not necessarily mean that those of us who make that statement intend to imply that we do not believe in the use of lime in some cases but we mean that in our particular case it is not needed. However, such a statement without further explanation would give the impression that the individual working it did not believe in liming at all and were he to go into some other part of the State where the use of lime was proving beneficial and helpful and make such a statement, his usefulness would be materially weakened.

Again we know that color is not in itself an indication of fertility, and colored water running from the barnyard may contain but little fertility—which statement we sometimes make—but yet is it not wise to impress the fact that while color does not necessarily signify fertility, if colored water is sweeping from the barnyard or from any place in proximity to manure, it is safer to assume that it may contain it and thus avoid the appearance of evil. Wrong impressions are often left as a result of failure to appreciate some of these details.

Conservatism, especially with reference to some of the more recent developments in the field of agriculture, is desirable. While much that might be said may be based upon actual fact, yet statements are likely to be made upon insufficient evidence, the practical details have not been sufficiently worked out or too strong statements with reference to some of these matters may mislead those who are not entirely familiar with the facts. Experiments conducted by the United States Department of Agriculture in Florida, by the Experiment Station in Conn., and by the Lancaster County Tobacco Growers' Association, in conjunction with our own Experiment Station, have shown that Sumatra wrapper leaf of fine quality may be grown under canvas, and if this can be done successfully it will prove to be of great advantage to our tobacco growers. While these experiments have in some cases proven quite successful as a whole, the results are not sufficiently comprehensive to make it possible to safely advise anyone to attempt the growing of tobacco in this way commercially. Therefore at the present time even though it has been done—it is well to take conservative ground and await further developments rather than attempt to advise its use.

Again, much has been said recently about soil inoculation. We believe in bacteria and in soil inoculation, but too broad statements may lead many to believe that inoculation is all they require to grow large crops of clover and other legumes and they may waste considerable cash in learning that inoculation is not the only condition required and that even where it may be needed, can not be done successfully unless the other conditions are what they should be.

And, finally, the institute man is supposed upon all occasions and under all circumstances, to preserve his equanimity and support with dignity his position.

The CHAIRMAN: The subject is now open for discussion.

MR. NORTHUP: Mr. Chairman, I am sometimes troubled with a gift of continuance, but I am going to talk just five minutes now, and then stop. I want to talk about the county chairman, with the exception of Lackawanna county. I won't say anything about that, but I believe they are the best class of men that you can get any-

where in the State of Pennsylvania in our pursuits. They understand their business and you can't help loving every one of them. I do not believe there is any mistake made in Pennsylvania in regard to these chairmen, but I believe a chairman sometimes makes a mistake when he puts in a substitute. Some of them have so much business, you know, they have to go away, and then they put in another fellow to manage the institute. I have thought sometimes that he was put in because he was the best friend they had in the world, and did not seem to be adapted at all to the situation.

I have seen a fellow get in the presiding officer's chair who did not take very much responsibility upon himself. He was merely there to have a good time. He announced that the first speaker would occupy the floor and then he laid down the program as indifferently as if he was going to sleep. He didn't seem to think he had anything to do until the next fellow came upon the floor. Then he takes up the program and has to get out his spectacles and wipe them off and then has to look to see who the fellow is and then he reads it off in just such a way that the speaker feels as if he had never had such a send-off in all his life before, and wishes that he was never an Institute speaker in the world. There is another thing about it; they introduce these fellows and tell who they are. I have seen a gentleman stand on a platform and introduce a speaker when you couldn't tell ten feet away what he said and when the speaker got up he had to introduce himself over again. It seems to me that is a mistake, and that when a man is substituted he wants to be as good or better than the chairman himself, and the Institute runs all right.

I have got a little something to say about the speaker—I am not talking about the speaker from Lackawanna county. Some speakers are afflicted with what I call the gift of continuance, and there are some who get wonderfully careless, who begin to talk in a monotonous tone and who forget that it is their business to interest the people until some way or other they get hypnotized and put to sleep. You know there has got to be something to arouse that interest or it will die right there. I believe the best way is to have some music, and I have seen the chairman when such a fellow as that was talking step down to the choir and say, "Now if you have got any soul-stirring music, give it to the audience when this fellow stops," and that will revive it, and put new life into it. You can't succeed in farmers' institute work when people are sleeping.

At a political meeting in Lackawanna county, a Republican party meeting, a very prominent Democrat had a lot to say, and the problem was, how to get rid of him. He was a member of the Legislature. He talked and talked and there was a certain member of the audience who fell asleep, and after a while he waked up, just in

the midst of the meeting and in a rather dazed condition, he said, "Gentlemen, what appears to be the excitement?" We want these fellows in the farmers' institute than can wake up men.

Now as to the topics to be presented. We want all these practical topics on our program to-day presented. We can't get along without the dairy, potato growing, and the fertility of the soil and all those topics; we want the educational topics, all of those; they must come in. I wish it was so right in this body, that there would be a dairyman, a fruit man, a potato grower, and all these interests represented and then we shall have good work.

When you get two or three all talking on the same topic, there will be a conflict. What we want is to get at the truth; get at facts through the experience of others.

The CHAIRMAN: I will call the roll so that all may have an opportunity to speak.

Several counties were called and the members either declined to speak or were not present, until Blair county was reached, when Mr. H. L. Harvey, of Kipple, responded as follows:

MR. HARVEY: Mr. President and Fellow-Farmers: Perhaps there is more of somebody else than there are of farmers. I am not accustomed to speaking in public, but this seems to be one of the important questions. If there is anything I dislike to talk about before the people, it is something I am trying to do myself. I have been endeavoring to fill this position for some years and I have enjoyed the work. It is a glorious work to educate the farmers, as they have the highest calling in the world, and our labors have been harmonious and pleasant. Our masters which we recognize, is the present man that fills the position of an Institute Director in the State. He has made a success of his appointment. We look to him as a good director. He has helped us when we have called upon him to help us and I am glad to say that he has got along very well. In many respects the position is an important one, and to accomplish the best results, it seems to be the hardest thing I have ever undertaken.

I may talk a little over five minutes; if I do, why call me down. I didn't take my watch out, but I want to say that to get the farmers to meet is the point I want to reach if possible. How shall we do it? There are a class of people in Central Pennsylvania in a number of counties that think they know enough about farming; they tell me so. They say, all we want is the land; when they are as ignorant as boys in reference to the great subject that they are trying to follow. It seems to me that we ought to get something to stir those people from the present position that they occupy, an unfortunate position, to be satisfied with what they know. We are

always young enough to learn, and ought to be always trying to learn, and I would like to have a subject suggested by somebody that would show to the people the difference between intelligent farming, and ignorant or uneducated farming. If they would see the difference, it seems to me they would be aroused and be willing to learn. At present they are asleep.

The Apostle Paul, in one of his discourses, told men to awake out of their sleep and arise from the dead. When you come to talk to the farmers, a light comes from Harrisburg and from the State College, so that anybody who desires to have a farmer's education can get it.

These things are very important. That is one subject that I hope somebody will frame up so it will not be a question but cause them to know that they don't know enough, don't know anything, scarcely, and that they will try to get the education that they can get by making an effort.

There are other subjects. One question we want to mention, is to keep before the people the problem of public roads. We have the worst public roads perhaps of any other state in the Union; I mean of the older states. Then another question is the high school, or the concentration of the township schools. We want that kept before the people because it is important. Then we want a better class of live-stock; more thoroughbred stock we need in our State, and especially in Blair county where I am well acquainted. We need all these things. A more thorough cultivation of the soil is very important. I am satisfied that the soil is not as well cultivated up in Blair county as it is in this county of Chester, judging from what I have seen in looking over the farms here as I have passed along the public road during these two days.

I did not expect to make a long talk; I didn't intend to talk at all unless I was called out. I am not accustomed to public speaking, but I desired to say these few things. I am much pleased with our meeting. It has been grand ever since we have been here together. I consider these the best meetings we have during the year, these round-up meetings. The Agricultural Department of Pennsylvania is doing the very best of work, and the State College, just look what it is doing; look at the work that comes out from there, and the Grange; look what that is doing. The distribution of literature is wonderful at this age, and there is nobody doing any better than our agricultural department; nobody is doing any better than the College in that line, and the opportunity for the chairmen to do good work is to receive these publications and spread them among the people.

MR. DIEHL, Bedford County: Mr. Chairman, Mr. Harvey has about expressed by views on that subject; therefore I will not say anything.

MR. CHUBBUCK, Bradford County: Mr. Chairman, it is with a great deal of embarrassment that I rise to say anything. I am wholly unprepared, but I have jotted down a little bit here. I am very new in this business, being only one year old in taking charge of Institutes and being from a county of such size that my chief trouble has been to locate institutes throughout the county that were near enough together so that I did not have to take gentlemen who are on a strain through the whole winter, over too much territory. The county which I represent has about 7,000 farms, and across it from east to west and north to south is nearly thirty miles. My brother here says it is more than thirty. It is a long distance, anyway, and in order to satisfy people, it seems to be necessary to put at least two institutes at each side of the county, dividing them into east and west. As far as the attendance is concerned, we have found that the attendance as a rule is only limited by the size of the room. I think that the lecturers that were with us last year will agree that that is so, no matter what the size of the room was, we always had it filled. The attendance being so good, we have not had to look after that.

Now the people throughout the county, I think, are taking every advantage of this institute work. I have had application after application asking about these cultures from gentlemen who wanted to know about inoculated soil; and I also know of a great many Babcock testers that have been bought in my county since this subject was brought into importance.

We have one special educational session and our county superintendent gets around to all our institutes and attends to this one. We make a point of having an educational session that is right up to date. We have an educational county that is among the very first in the State, and we are following up the consolidation of schools. We have that brought up in our institutes and our people are taking a great deal of interest in the subject.

The CHAIRMAN: I have a few words that I would like to say to the lecturers. I think it would help the county chairman out to prepare a syllabus—if each lecturer would prepare a syllabus of his lecture and send around before he goes into the institute to present it, and I would also suggest that when men are sent out, and for any reason, are not able to come, that they let us know in time so that we may procure a substitute. We had a little trouble with that this last winter. There were two men sent to our county—it is a dairy county, and they were neither one present when the in-

stitute convened. One man didn't send word until the day after he was to be there. When the lecturer cannot come, I think he should notify the directors of the institute so that a substitute may be provided. We had men that drove fifteen miles last winter to hear the talk on dairy subjects and there was nobody there to talk to them. I would also suggest that where the districts adjoin, institutes should not be held at the same time.

MR. RIDDLE, Butler County: Mr. Chairman, I have never had any difficulty in having an interest in institutes and I think I have had with me almost all the leading lecturers, and our institutes have always been a success.

One thing, however, that I want to talk about is this: That sometimes institute workers make extravagant statements. A number of years ago, with a party to whom I am about to refer—he is not now on the institute force—but a number of years ago he was in our county as a member of the institute working force, and he made such extravagant statements, that I deemed it my duty as chairman, to call his attention to the fact. One of the statements he made was that he had a cow which produced three pounds of butter a day. After he made that statement, I called his attention to it. I said, "You ought to be a little guarded in your statements; that statement is misleading. It may be true but it is pretty hard to swallow any such statement." I want to say further that that gentleman had a chart that he used in his illustrations, and after he had gone through our county, while sitting before him one day, I said to him, "Have you noticed that there are two words in your chart which are misspelled?" No, he hadn't noticed that. These misstatements leave an undesirable impression, and create a feeling that the rest of the matter being given may also be unreliable. You know, Mr. Chairman, that the royal road to success has never been discovered, and I want to say this, that one of the most important things that a lecturer before an institute can keep in mind, one of the best impressions he can make and one of the surest impressions that he ought to leave, is the fact that there is no excellence without great labor; that is as true to-day as it was when we read it in our Fourth Reader when we were boys at school. It is a truth from which no power of genius can absolve us. If that impression is left, the institute work will be more successful.

Last winter a new force was sent to our county, and when our institutes had been located and announced, a number of men came to me and said, "Why do you have a new force this winter?" I said, "I have nothing at all to do with it." I said I knew the gentlemen but I didn't know how effective they were as institute workers. After they came into the county and held their institutes, these men came

to me, many of them, in fact a great majority of them, and were better pleased than ever; as well pleased as if they had had the selection of the speakers themselves.

Now, Mr. Chairman, I want to say that if the institute workers of this State want to make institutes a success, if they want to make the Department of Agriculture of our State the success that it ought to be made, they must each and all be loyal to the administration of the Department of Agriculture, and if they are, I know the work that is being done will be successful and that the Department of Agriculture will be even a greater success than it has been in the past or is at the present.

MR. HALL: Mr. Chairman, for the benefit of those of us who have to twist our necks around, will you ask the speakers to kindly take the front.

DEPUTY SECRETARY MARTIN: Gentlemen, you all have difficulties in your work. Now I would like to suggest that you make that a prominent feature of your discussion. We want to hear about that, and profit by one another's experience.

MR. HOWARD, Cameron County: Mr. Chairman, for the last five years I have been the County Chairman in our county. Just why they put me on, I don't know. Of course I had a farm, but I am no farmer. I am, as Brother Herr says, an "agriculturist," but we have been holding institutes in our county for a number of years, and at first they were well attended, but for some reason or other they run down, and I guess they put me on because they couldn't get anybody else that would take them. The first two years I was very much discouraged. We probably would open up the meetings with six or eight, or ten or fifteen farmers, an audience of from twenty to twenty-five was about the average, and one or two instances there were only about half a dozen, and in the evenings there would be probably fifty or a hundred, something like that.

It has been said that the National government was doing a great work for the farmers in sending out their publications, and it was also stated last night that the farmers are not much for reading, and I think the assertion is borne out that these pamphlets and circulars and year books, etc.—that are sent out—that probably not more than five or ten per cent. are read. They are well worth reading, but if the farmers don't read them, what good are they? What is the use of all that expense when it does not produce the result? And there is where the farmers' institutes come in. If the farmers won't read, why, hold your institutes and drill it into them; talk it into them. They will sit and listen to you and hear you talk, but they won't take a book and sit down and read it. Hence, I say, the farmers' institutes are doing good work. Tell them about these

things in your farmers' institutes, but if you can't get the farmers there, then you are not getting the real benefit you ought. How shall we get them there? What shall we do to induce them to attend? That is the question, and as I said before, at first I was very much discouraged when I found that the farmers in my county were not inclined to take advantage of these farmers' institutes, and these lecturers that are being provided; in fact, when I would inquire of the farmers why they didn't come to the meeting, they would say to me in reply: "What do they know about farming, anyhow? They never got behind a plow and plowed; all this book learning is well enough on paper and well enough to tell about." So, as I said I was very much discouraged. I didn't want to stand up there and spend all this money and time and have only a few come out.

Now you can't always drive a horse or any other animal to water and make him drink, but sometimes you can coax him, a little coaxing, a little tact will bring him around, so I thought I would introduce something like that. I have been sending out these circulars to the farmers, as well as the postal cards. The last week before the meeting, I would write to every farmer three letters during that week, three postal cards or letters, and ask each one to come, and it occurred to me in my effort to increase the attendance, that I would do a little coaxing and devise some new method to interest them, so I hit upon a plan and I offered prizes of a barrel of flour, a half a barrel of flour, a ham and a pig for each day, what I called an attendance prize. Now, you know, some people who can get something for nothing, they will always be on hand, and if there is a little lottery connected with it, you will find them all flocking there. If there is a raffle in town, they will go down to the raffle, because there is a chance there of getting something for nothing. We didn't even charge for admission. We simply offered these prizes. Every person entering the hall or the room—we held our meetings in the Court House—was given a ticket with a number on it. If he came in the morning he got a ticket; if he came in the afternoon he got a ticket, and if he came in the evening he got one. If he was there the whole three sessions of the day, he got three tickets. At the end of the session, in the evening, after all was through, I put a lot of slips in a cigar box according to the number of tickets given out during the day. If there were fifty tickets given out to-day, we put in fifty slips in the cigar box. If there were seventy-five given out, we put in seventy-five. If there were a hundred and fifty given out, we put a hundred and fifty in the box, etc. We shook all these tickets up, and then we had the drawing, and the first ticket that came out got the barrel of flour. Whoever had that ticket got that prize. The second ticket that came out got the half-barrel of flour. The holder of the third ticket got the ham, and the holder of the

fourth ticket got the pig. The first year, although I advertised it, while there was quite an increase in the attendance, I presume that a great many of them came out of curiosity, to see whether I would fulfill my promise. Whenever we say we will do anything in our county, it has to be done, no matter what it costs it has to be done. I intended to have all these prizes right there at the time. I had the flour on the table in the sacks. I had the ham also lying there, but the pig I was unable to get. In sending out my requests to come to the meeting, I asked every one to tell me where I could get a pig, but as we hold our meetings in January and February, it is rather difficult to get shoats up there. One party sent me a little China pig, so I had the china pig lying on the judge's desk, but as I couldn't give them a pig, I gave them what I considered the equivalent of the pig, a two-dollar bill.

I gave these tickets to everybody, man, woman and child. I didn't care who they were, because these things interest them or should interest them all. I consider they are as largely for the child as they are for the farmer or older person. I believe the child is more entitled to them, if anything. You can talk to these old heads and they have got their set views and they will not listen to you, but the boys, the younger persons who have not got set in their ways, they will drink it in, and some day it will produce good results in the boys, and that is another reason why farming, I believe, should be taught in our public schools. Take these young people that are growing up, the beginners even, and talk to them about bugs and flowers, etc., how they grow. Teach them these things and they will keep on progressing.

The next year we had some very good meetings and last year I had the largest of the three, and I want to tell you, this last year, instead of having a few seats in front, the same as this audience is now, we had every seat in the room filled, and we had to bring in chairs and filled up the hall.

MR. McCLELLAN, Clarion County: Mr. Chairman, I have not very much to say in regard to this subject, in fact I am not very much of a talker. We have a pretty good attendance in our institutes, and the people take a pretty good interest in them. The worst thing is, to get a place to hold them. We generally have to hold them in the churches, and we have some among us who are not in favor of holding the institutes in the churches. Some who have a little bit of religion in the back-bone instead of the heart, rather object to it. I am not like my friend in Bradford in regard to locating my institutes. We have got between 34,000 and 35,000 inhabitants in my county and I try to locate them in such away as to reach the greatest number of people interested in them. I try to provide a way to get the State speakers transported from one

place to the other, and any one that cannot stand the transportation, we will try to send him to the hospital for a few days. I didn't know how it would be with Brother Lighty last winter but he got through all right, for I see he is able to be here. On one occasion we had nineteen miles to drive through snow-drifts, and in some places had to shovel out the horses and in another place had to drive eighteen miles through snow-drifts to attend the institute, and the next place was eighteen miles further. That is the way our institutes are located. We have full houses, and the people are interested in them. There are, as Brother Howard says, some old foggy farmers that we can't change. We must get to the young people; get them interested; that is where we will receive our benefit. I would like to be favored with speakers of a diversified class of farming, and not strictly one kind. We change our programs. When I make up a program, I go to the place where I am about to hold an institute and appoint my local committeemen and send their names in to Director Martin and set a time to go to that place for holding the institute and help make up the program, with the understanding that when the speakers come there, they can change these programs.

We always have an educational session. We are able to get the county superintendent to attend one institute. We have had some very good instructors there last winter. I have no complaint to make of my people in regard to attending the institutes. We have very good attendance and good attention.

MR. NELSON, Clearfield County: Mr. Chairman, I havn't had the trouble in Clearfield that some have spoken of. We had to get a policeman last winter to keep them from tearing the hall down. I think the Deputy Secretary will testify to that. The attendance at the local institute in March of this year was very good, notwithstanding the fact that it rained before the institute began, and continued until after it was over, and the roads were almost impassable. There has been so much interest shown on the part of the people in institute work that we re-organized our agricultural society during the past winter and appointed twelve vice presidents and divided the county into twelve districts, and we expect to hold twelve institutes; that will relieve me in carrying on the work. We do not have to give any prizes there to get the people to come out. I think we ought to send a missionary over into Cameron county, from what friend Howard says about his experience there.

A Member: You have no agricultural fair in your county?

MR. NELSON: No, not now; there was so much horse-racing and gambling that the people were against it. It is not necessary to have the fair to get the hundred dollars appropriation.

Gentlemen, the county institute manager should have some qualifications of his own. He should be an enthusiastic institute worker himself to begin with. He should be able to take care of his institute, always appointing a live, local committee, fixing the time when the institute is to be held and going there to help them prepare a program, then before the institute opens he should go and see that all the preparations have been properly made. We have trouble in getting halls large enough. There are no halls in our county sufficiently large in which to hold our farmers' institutes without we use a church, and so many of our institute speakers think that the farmers need to be entertained by telling funny stories that they sometimes trample on people's toes, and we have been deprived of the use of one or two of the churches on that account. If you get audiences enthusiastic and heartily interested, it is not necessary to tell them stories to keep them quiet.

Second, he should have ability; he should be a good parliamentarian; he should always have complete control of his institutes, not only of the people who attend, but of the speakers as well, and to do that he must keep his institute running. I made a mistake at one time and Colonel Woodward corrected me for it. I once appointed a local politician to preside, and he always took a long time telling that certain people not in attendance were not present. One thing must be kept in mind. Whenever you give people the time to commence to talk and whisper, you lose control of your audience, and I make it a point to insist that there shall not be any of that done. I know that it annoys the speakers and it also annoys the chairman. Extravagant and unexplained statements are the chief causes of arguments against our institute work. The chairman, while being very careful, should be able to lead and not drive, and see that these things are not done.

We used to have through our county, occasionally, some people who were so enthusiastic about liming land that they were full of it. It makes a good deal of difference whether you make the money yourself or carry it. They would say it would pay to put three, four and five hundred bushels of lime on an acre. Those people could talk to you very learnedly about dairying. The only two worthless cows I ever bought in my life were from institute workers who could make a good speech at an institute and tell you all about cows.

The Chairman also must have tact in managing his audience and speakers, and prompting them when necessary. I have had institute speakers sent to me who would get up cornerwise to the audience, probably with one foot on a chair-rung, perhaps with their backs turned to the audience, and who would talk in such a way that one would not be able to tell one-third of what he really did know. I always think that such speakers should take a course of

instruction and practice a little before they go out into institute work in the country.

MR. HERR, Clinton County: Mr. Chairman, I am glad that Mr. Nelson made his speech; it relieved me from part of mine. I won't undertake to tell my experience in holding institutes in Clinton county, and the few remarks I make will be in the line of Mr. Nelson's talk on the duties of county chairmen. I think that is really more what we want to know; our experience. The county chairman must be a man of prominence and have the respect and esteem of the community in his county. If he hasn't that, the sooner he is out of the business, the better; get some one who has it. He must have some executive ability. He must have some knowledge of institute work. We cannot expect everybody to have that. There are newcomers who have never had that experience and knowledge, but he ought to know who his speakers are, and be able to introduce them so as to tell the audience who they are, and what they may reasonably expect from them, and as to their reliability, whether they are actual workers on the farm, and whether they have had actual experience. It is well enough to be courteous, but you can pile it on too thick and embarrass the speaker, when you lose the respect of the audience. I do not believe in being too complimentary to the speaker. There is such a thing as overdoing that. There are some people who are like myself, a little light-headed, so they will readily, if you compliment them a little too much, think they have got so much valuable information and are so highly appreciated by the audience, that they do not give their audience the credit of knowing a little more than they do.

Now a county chairman ought to be an organizer; he ought to have his heart in his work; ought to be willing to work a great deal in preparing for the work in his institutes; ought to be willing to sacrifice of his own means and his time and have his heart in the work. He must know the people; know his county and know how to make arrangements to get the speakers from one part to the other in the best possible manner, know how to make them comfortable and feel at home, and provide a proper place for their accommodation. He must know the people well enough to have the confidence of the people, so as to be able to secure proper accommodations for the speakers. He must know how to advertise; he has got to have the confidence of the press with him. If he has that they will print anything he asks of them free of charge.

He must be able to use the funds of the Department economically and wisely, and he must be able to show to the people just what he does with the funds. A great many institute managers are suspected of doing something with the funds not allowable. People think there is some money in it. What he does with the funds

ought at all times to be brought out and made known to the public. Let everybody know just what it costs; what he gets and where the money goes.

MR. OLIVER, Crawford County: Mr. Chairman, we try to make the institutes in Crawford county practical. One of the first things that I do is to call my committee together at the county-seat, for I think that is the proper place. I try to invest them with at least as much enthusiasm as I have. I try to make them think that the success of the institute depends as much upon their activity and the effort they put forth, as it does upon my own. We try to make the institute practical from the beginning to the end; and I may say that our rooms in which our institutes are held, sometimes in a church and sometimes in a hall, are filled and often more than filled. Of course some of our institutes are better than others.

I think that the chairman should get in touch with the people so as to know what are the things they most desire to have discussed at the institute. The housewife, if she has company, and only knows the dishes her company most delight in, can easily prepare a feast for them; so I think if the committee, an active committee, comes so close in touch with the people there as to know what are the subjects in which they are interested, they will know how to prepare an interesting program and know what subjects should be discussed.

REV. T. J. FERGUSON, Cumberland County: Mr. Chairman, I have just a word to justify my presence here as a county manager. There were two things yesterday that made me feel very comfortable, sitting among you as a manager of farmers' institutes. One was the splendid address we had last night on the importance of farmers' institutes in public education, touching the lives of the whole rural community, and as a minister I have always been interested in more things than simply the affairs of my congregation. I have been interested in good schools, good roads, good health, and everything that touches the rural communities has been an object of my interest, and that is one of the things that made me feel very comfortable among you. The other was in connection with that splendid entertainment that Mr. Kates gave us yesterday.

It was a matter of great interest to me to see this body of institute managers and lecturers sitting at the feet, or standing at the feet of a brother minister, learning the lessons of soil fertilization. We heard in the morning that the chemist, a very high authority, could tell us absolutely nothing about available and unavailable plant food, and so Mr. Kates took us back to the country and in that delightful ride and entertainment, gave us an object lesson, and so we sat at the feet of a brother minister and learned about soil fertility; therefore I feel that I am justified in being here.

I do not preside at our meetings; I try to see that there is somebody to preside who can do it. I do not pick out the local politician, or some member that is not capable of doing it. I believe that the institute ought to be a source of education and development for the farmer, and there is nothing that will develop a man like making him the presiding officer at some meeting, and it gets the whole farming element in touch with him and gives him an up-lift.

My brother from Cameron county has given us an original idea. He spoke about holding their meetings in the Court House. I may say that when I became manager of institutes, they were held in the larger towns, two larger towns of Cumberland county, and I think that we would have had to have the ham and the pig to keep up the interest there. When I became manager, I took the meetings out into the country and we have no trouble about getting full houses, and the people we get together are practical farmers. I have lived in the community in which I am now for more than a quarter of a century. I know the county and the people. I am able to select men to compose the local committees that will be interested in the institute work.

A wise minister will not do anything himself that he can get anybody else to do, and I believe that is the wise principle in the management of our local affairs. If we can get good local committees, everything will move on in good shape. We have our little experiences. One man put in a bill for \$5.50 for the posters sent out by the Department. Well, he was without the job the next year. I wish that we could have more institutes. What are two institutes, four days institutes, in the great county of Cumberland in educating and lifting them up in connection with this great work. I wish we could have more institutes for the farming element, and if we would stand together for our own interests, knowing what we want, I tell you, friends, that the men who manage things would come and ask us what we want, instead of saying that we can count upon these men to go with us under all circumstances.

Mr. Kates, being present, was called on by the Chairman.

MR. KATES: Mr. Chairman, it is with a feeling of much timidity that I respond to the suggestion that I say a few words. Unfortunately, I don't know enough about agriculture to give you any of my experience. I don't have to know anything about agriculture; Mr. Detrich knows it all. But there was one word used here about twenty minutes ago which turned my thoughts to something which I am somewhat familiar with, which might be used in your institutes. It is, therefore, a sort of a question I am stating. The point that occurred to me was, that when you state that in your institutes it would be advisable to have a syllabus prepared and sent out

sometime before the institute would be held, that the traveling libraries might be used in conjunction with your institutes. If you have a syllabus, it would be necessary, I suppose, to have some books to aid one beyond the syllabus, so that one would be better prepared to recognize what the instructor was saying. The State, as you know, supplies the traveling libraries, and I believe they have received a rather larger apportionment of the State's money this year than ever before. My very dear friend, the Hon. Mr. Montgomery, is the State Librarian, and I know that he would do anything in his power to bring his Department into touch with the farmers' interests. Mr. Montgomery has always had a great love for farming, and his farm I think most of you passed yesterday on the way over to my farm.. These books are obtainable in sets of either twenty-five or fifty, and suppose, for instance, that one of the topics of discussion should be corn and the syllabus would explain the different points that would be brought up; by having one or two books in this traveling library on corn, it would be a help to the locality. The books could remain from one month to six months. I merely present this matter to you for your consideration, as I thought this to be the educational section of your institute.

A Member: What are the conditions necessary in order to get the books?

MR. KATES: A formal application is made to the State Librarian who is a member of the traveling library commission, and afterwards there is a very simple form to be filled out, one or two persons becoming responsible for this library. It is absolutely a mere matter of form. The books always come back, and almost always in very good condition. The cost is that of transportation only. The idea of the traveling library is, that after a community becomes accustomed to having these fresh, new, nice looking books with them from time to time, it stirs up an interest, and this traveling library soon grows into a stationary library. The books, of course, would be chosen by the institute lecturers and by Mr. Martin, and I know that his aptitude for taking up everything in the line of agriculture in the State, would assure a good selection, and I know he would find Mr. Montgomery a very congenial individual to work with.

The DEPUTY SECRETARY: I might add, in a supplementary way, that I have found the present librarian, Mr. Montgomery, a very friendly ally in the way of procuring and distributing literature of a high standard, such literature as is well adapted to the needs and wants of the farming communities of Pennsylvania; and since it has cropped out here on one or two occasions that we farmers are not just quite up on reading, that is, that we are a little deficient in our reading, I at this time take occasion to suggest to the county man

agers of institutes, that they get in correspondence with the State Librarian. They can procure, at a nominal cost and expense, for their communities and counties and townships, a supply of these traveling libraries, selecting such books as directly apply to education along the lines of agriculture, and the arts and sciences, history, biography and all these things that will broaden out and elevate the minds of the boys and girls in the families upon the farm.

Time will not permit to speak further upon this matter. I am gratified that Mr. Kates has called our attention to this, and I only regret that Mr. Montgomery himself is not present to fully present this matter to us upon this occasion.

MR. KAHLER, Lycoming County: Mr. Chairman, I would just like to say a word in regard to this library question, in which we have had a little experience. As has already been stated by your good friend, Mr. Kates, you can get them upon application by signing a bond for the proper care of the library, and as he has already stated, all that it will cost is the transportation, namely three dollars, and then we can select from a number of books the kinds of books wanted. And I will say further, that you will find that the literature is first-class and up-to-date in every respect. The way we manage the matter is this: Before we let the volumes out, we appoint a librarian, who takes the names of all persons taking out the books. They are not allowed to keep them over ten days without permission. At the end of that period they can return one book and get another; each person taking out a book is charged with it, and under obligation to return it in good condition. After the library has remained in our care for three months, we are expected to return it, or file an application for its retention during another period, or we can exchange libraries with some neighboring community, and in that way save transportation, although we have to pay the expense of transportation every time we make a change.

I am very much pleased that our Director of Institutes has recommended that the chairmen of our different counties bring this to the attention of the people in their several communities, because the whole thing of agriculture simply boils itself down to education, and that is one of the means of obtaining it. I hope it will be taken up and acted upon in every county in the State.

MR. HERR: Mr. Chairman, just one thought in regard to that syllabus; I do not believe it is practicable unless you have the syllabus in advance and have it published in the county paper. It is too late when it comes to the institute. You cannot distribute them at the proper time, and the only thing I see would be to get it in advance and publish it in the county paper; and then the other difficulty I see is, that perhaps the speaker will not be there himself.

MR. HUTCHISON: Mr. Chairman, I was just going to say a word in regard to Mr. Kates' suggestion as to traveling libraries. The matter was presented to the State Grange and quite a number of these libraries are now in use in the different localities, doing good work. You can get them by sending a fee of ten dollars, and appointing two trustees. We have in our grange now the third library, doing good work. We have found them to be very good books, and our people are very much pleased with them. I hope that the directors and others here will take advantage of this offer. I know that Mr. Montgomery is very anxious to do all he can for the country people throughout the Commonwealth.

MR. WITMAN, Elk County: Mr. Chairman, the situation in Elk county is somewhat similar to that described by my neighbor and friend, Mr. Howard. There is only one locality in my county where the farmers attend institutes, in fact, it is the only real farming community. They do not gain their livelihood in Elk county by farming. It is from the forests and mines. I might experiment with the same inducements my friend Howard did, but I would make a few substitutions in this lottery plan. Now the question arises, Is it worth while to have such an audience? I think not. As long as we have such a condition of things, and the people of Elk county do not depend on the farm for their living, I do not think the inducement will be sufficient to get them to a farmers' institute. I think we would highly appreciate a course in farm science. If we could have a similar course to that in our high schools, I think it would be very much appreciated, and very beneficial. Let us have a system, and we have people who will appreciate it. Our institutes are not quite equal to what they were several years ago just on this account. The subjects that have been presented of late are worn out and we need something new that will awaken a new interest.

MR. HALL, Potter County: Mr. Chairman, as one of the members who are indebted to Mr. Kates for his kindness of yesterday, I want to say that it was the regret of every one that we had no opportunity to express our appreciation of his liberality and kindness, as we did not know the gentleman yesterday, and I move you sir that this institute give him a rising vote of thanks for the courtesy and kindness which he extended to us.

The motion having been duly seconded, it was unanimously agreed to by a rising vote.

MR. KATES: Mr. Chairman, I may say, in acknowledgment, that while Dr. Detrich and myself were very highly gratified that you took the trouble to come over to our farm, the debt is entirely on our side.

MR. BILLINGS, Erie County: Mr. Chairman, as the most of you

know, Erie county is practically a dairy county, and I am right in the midst of the dairy section in the southern part, and what I may have to say will refer principally to the topic of dairying. Now in regard to the county chairman. The first thing he has to attend to is attention, and to get attention he must get his audience to work, and in order to get his audience to work, he must get his speakers out in front where they can be seen and heard. I was very glad to see that brought out here. I was very glad to see that these chairmen were called out as they were here, and the five minutes' limitation that was given us, was a good point illustrated here in this meeting, because there are chairmen here and there are lecturers that would take the whole time, if permitted, and there are chairmen here and many of them, myself among the number, who would not have got up and said anything unless we were called out.

There is one thing that I want to mention, that I am sorry to see in our meetings here. I have observed that our lecturers are the ones who do the most whispering. Now it is very embarrassing to the chairman of a local institute to be annoyed in that way. While we are not annoyed in our local meetings in that way, we are here. Of course you lecturers are not especially interested, probably, in these discussions in reference to the duties of the county chairmen, and you don't care to hear what we say, so you get among yourselves and talk, and it does annoy our meeting.

As I have said, get your speakers out in front; I think that is the first thing to do. Many times it is hard work for the local manager to get his speakers out in front of his audience so that they can be heard. They will stand back, and they will get twisted around sideways and it creates an uneasiness and there is difficulty in hearing, and the audience soon tires, even the professors and our superintendents of schools are sometimes quite diffident about getting out in front. They want to get up and speak where they are, but I say, bring them out to the front.

Another thing I think is quite important, and that is, for the chairmen to surround themselves with two or three good helpers; good responsible men that he knows will be there. I might, if I had time, give you a little experience that I had last winter. My helpers all fell off but one, but he was a man that I could depend upon and we pushed our institute right through. One-half of our speakers did not appear, but still we made a success of it, so I say, surround yourselves with two or three or four good responsible men who will stand right by you, and you will make it a success everytime. Let there be an institute located where the people want it. If the people do not ask for institutes you will have hard work to get such communities interested in the institute work, and to get them to do the work required to make an institute a success.

A few topics that I think would be of value, and interest to the farmers of our locality are, as I said at the outset, those specially related to dairying; and another one is, better roads. And I would like it, if in this meeting we had time to have Prof. Hamilton, or some one else, explain that we might take it home for consideration.

MR. HEGE, Franklin County: Mr. Chairman, I gave my time to Mr. Northup. When Mr. Northup took his seat, I felt like a colored brother we had at Chambersburg. He was not a very good brother, for sometimes he didn't tell the truth. He always had some colored man in the audience to say "amen" to what he said. One day he had a fellow picked out to say amen to what he said, but he didn't do it, and when the meeting was dismissed, he took him to task for it, and said, "Now Brother, you didn't say amen as you agreed to." "No," he said, "you lied, and I don't say amen when you lie," but Mr. Northup told us the truth, and I could heartily say amen to it.

I am sorry I don't remember the speaker's name who told us that up in his county there was only one place that he could hold an institute. (Mr. John M. Witman, of Elk county.) That it was a mining county and the people would not come out to be benefited. I think everybody ought to be benefited in a farmers' institute. I try to get the little boys and girls interested. You can educate them. A few years ago at Fayetteville, we were crowded for space in the afternoon, and a committee came to me and said, "This evening we are not going to admit the little boys and girls." I said, "How are you going to get over that?" "Why," they said, "we are going to have a man at the door and as the people enter we are not going to allow them to take the little boys and girls in." I replied, "That if I was going to an institute and had my little boy or girl with me, and I was refused admittance for the children, I would never come to your institute again." I said, "We will provide benches and chairs and seat the little boys and girls up there." We had forty or fifty or maybe sixty little boys and girls, and it was satisfactory to everybody. We want to be careful so that we don't offend anybody.

I know that before I was a member of the Board in our county, the institutes were always held in one place. The chairman would hold them for two or three days in his own town, and by the way, the people didn't take very much interest, only a few of his friends around town took an interest. He didn't introduce the strangers that came, that were anxious to know what a farmers' institute was; he didn't introduce them to the lecturers, but in a year or two he announced himself as a candidate for the Legislature. He was a Republican, but the Republicans didn't nominate him, and the next time he came out on the Prohibition ticket. He thought the Democrats would unite with the Prohibitionists but he was defeated, and then the next time he would have come out on the Democratic ticket

but they wouldn't have anything to do with him. We want to leave politics out of our institute work; it has no place there, and we should not permit it to exist.

MR. STEWART, Greene County: Mr. Chairman, I don't think that I have ever risen to speak until to-day. I have never been called upon, but I believe that when a chairman calls upon a private, he should rise. I am a believer in doing whatsoever thy hand findeth to do, and doing it with all your might. I possibly should rise for another reason: Being a comparative stranger here, in order that the men who may be sent to our county may have some idea of what manner of man will meet them when they enter the threshold of the county. The chairman is not able to do all things, but he can do many things with the co-operation of his people. The most important thing for him at first, is to enlist the co-operation of prominent people, and all the people, and it is proper for me to say that as far as I am concerned, as an humble chairman, that I shall endeavor to prepare the soil in Greene county to receive the facts and suggestions that are brought to us by the lecturers. I feel that it is a very wise provision of the State of Pennsylvania that these facts and suggestions can be brought to the doors and the firesides of the people of our county. I feel that I should be very modest in making any suggestions, but I have one suggestion, and that is that while heretofore in our county the first meetings have been held in the afternoon, I desire to suggest that the first meeting shall be held in the evening, because we will have a good deal better attendance in the evening session, and it will have a beneficial influence upon every meeting held thereafter.

The Chairman has suggested to us that we should state something or suggest something concerning our needs. I have not thought of that matter to any great extent, but I want to say that our needs are general. We have a wide variety of needs in our county almost all along the line of agricultural work, and consequently we need a variety of treatment to meet these needs. I want to say, gentlemen, that I want to render whatever service I possibly can in the work in which we are engaged so that it will reflect credit upon the Department as well as upon ourselves.

MR. HUTCHISON, Huntingdon County: Mr. Chairman, I would rather sit still and hear what the lecturers have to say to the institute managers. I would say first, to make an institute a success in any county, you must have the people's confidence and have them working together and have them helping to do the work. If any chairman starts in to boss the job, it will not be long until the people leave him. I get in touch with the Grange and try to hold my institutes in that section and get as many members as I can of that

organization interested. I try to get all elements interested, teachers and all. I like the educational idea. I think there should be a large section devoted to that and a person qualified to give instruction along that line. Then there is the question of domestic science, and all these questions that enter into home life; how to build a house and how to properly drain that house and heat it and light it.

But the great foundation of the work should be fertility. If we can raise good crops on our farms, improve their condition through the instruction received from these lecturers, then we have something tangible and practical to show for our work and something that will enable us to educate our children. I regard that as the great foundation for institute work, the proper preparation of the soil, and what it needs to bring better crops. Dairying should be one of your leading topics wherever the location is interested in that line. Then there is horticulture; that should be a leading topic. It should be studied, and the Director of Institutes should employ a suitable person to give instruction based on practical experience along this line.

I have had almost all the lecturers in this room in our county, and our people are alive on the subject. If you don't have a great crowd, if you get the farmers together, those who are really interested, if you have fifty farmers, or even half that number from the surrounding country you will do more good that afternoon than you will do with a large audience, if you get the proper instruction to these people. I do not believe in the one-day institute. It only gets people to them and they are done. With the one-day institute you have got your speakers on the road half the time and in the winter they get no rest. I hope that the time will come when we will have no more one-day institutes, but have regular two-day institutes, if not longer.

THE CHAIRMAN: I think it is the duty of every county chairman to inform Mr. Martin what he wants in his section. A dairy section of course wants instruction along the line of dairying; a fruit section along the line of fruit growing, and so on. Now if the respective county chairmen will advise Mr. Martin what is wanted by the people in their several sections, he will no doubt be able to supply them with lecturers who will furnish them with the instruction and the facts they need.

MR. RODGERS, Juniata County: Mr. Chairman, I did not expect to say anything; but it is said, the first duty of a soldier is to obey orders, and if we are ordered to come forward here, we should not hesitate to obey.

As you are all well aware, the county chairman in our county is elected by the Agricultural Society of the county, and I suppose they choose as nearly the right man as they know how. There is no

electioneering done for it in our county. This is the fourth term of my service. I have never asked for it, and didn't want it when I got it.

I think that one of the first duties of the chairmen of institute managers of the county, is to realize that they have a responsible duty to perform, and they have to try and fit themselves and prepare themselves for the responsibility that is resting upon them, and in so doing, they must get in touch with the agricultural men, the farmers and the working class of people of the county in which they live.

I think one of the important duties of the agricultural society is, to elect a man thoroughly acquainted with the county, acquainted with the different localities, and the wants of the farmers, with the horticulturists, the dairymen, or the educational department of his county. Then the place of holding three meetings would come right in here if he understands the locality and knows what the people want. We never hold an institute two years in succession in the same place. We take our institute from place to place in the county. We have struck a dividing line in the county, like this aisle going over here, the river is the dividing line in our county. We hold four-days' institute, two days at the west end, and two days at the east end of our county, and we try to get them as far apart as possible, so that we have from ten to thirty miles between the institutes, and sometimes further. We go where the people ask for it, and every time we hold an institute, they always want us to come back to the same place. We don't have any trouble in getting audiences now.

In regard to holding meetings in court houses, the first meeting I held after I was elected chairman, was in the court house. I made up my mind then, that so long as I remained chairman I would not go to a court house again. Some of the men who come to the county seat, want to go to the different offices or stores on different business, and we don't get them interested in the work that we should have. Some of you may differ as to this, but we cannot do it. The place is fixed by the county institute managers. Our agricultural society elects a gentleman to be represented on the Board of County Institute Managers, our Pomona Grange elects a man, a good man, the man that the Pomona Grange has got in that position now, is one of the best men in our county. I am sorry to say that he don't belong to the agricultural society of our county or I would feel like resigning right away and have him elected chairman of institutes in our county. He is a most excellent man, Mr. D. Bayers, able, intelligent and honest.

In regard to the time of holding these institutes in the different counties, the chairman has something to say; and yet, after all, we advised the Department when not to appoint the institutes for our

county. Unfortunately they overlooked something one year, a few years ago, and we had the institute three miles, or less than three miles, from our county seat, and had the county institute just at the time court was going on, and had a murder trial, and you may know that that took the people away. That is the only institute that has been held where we have had a failure.

MR. CLARK: Mr. Chairman, we have now had a pretty thorough discussion along this line, and I move you now that this part of the program be suspended, and the lecturers be given the last half-hour.

The motion being duly seconded, it was agreed to.

On motion, it was ordered that the speeches be limited to two minutes each.

PROF. WATTS: Mr. President, I was very much impressed by a remark made by our representative from Elk county that we should have a systematic school at our institutes and have some new topics for discussion. I think what we want is some of the old topics discussed with new vim and in a new way. We cannot dispense with discussion on the important topics that effect every farmer, even if they are old, and I hold to the theory that it is not so much new topics that we need, as it is new light on the old topics, and the creation of a new interest in them by discussing them with new vim and new enthusiasm.

MR. SEEDS, Huntingdon County: Mr. Chairman, I can't get time to stop in two minutes. I want to say that I have traveled over the State of Pennsylvania and if I have said anything I am sorry for, I am glad of it. Every now and then they rub it in on me about my stories and I want to defend myself along that line. I haven't got anything to apologize for. When I go into a county like Kahler's county, they say, "Don't you tell that story in this town. A man in Lancaster told that story here, and the audience wouldn't accept it." Now I want to say, if a man steals my story and tells it, it is not my fault. I want to say another thing. I never tell a story unless there is a moral back of it. I am in the habit of telling some stories, it is true, and among them I have told a story that illustrates the idea that we have got to get away from home, and if the institute don't do another thing but get the farmer away from home, it is a success. The trouble with a good many is, they don't get away from home, and they don't come in contact with the world. They don't know what kind of people there are in the world.

There was an old farmer up here in the country near Scranton, and he went to hear Sam. Jones lecture, and before he went to hear that lecture, he didn't know that he didn't love his wife, and he sat in the hall in Scranton, and in that lecture, Sam. Jones ripped the

man up the back who didn't love his wife, and old man Hall said, "I am the man, I am the man," and old man Hall went away from that lecture with a new thought in his mind. It waked him up, and he said, "I am going back home and I am going to spark Mrs. Hall over again," and he left Scranton, and he went out home, and went into his house where he found his wife hard at work, and he put his arms around her and he hugged her and kissed her, a thing he hadn't done before for fifteen years, and she turned around, and said, "Go away, you old fool, you've been drinking."

Mr. W. H. Stout gave a synopsis of the following paper which is inserted in full, as follows:

THE COUNTY CHAIRMAN AND INSTITUTE LECTURER.

BY W. H. STOUT, *Pinegrove, Pa.*

This subject has been discussed before several previous meetings and is a somewhat complex problem. Acting in the dual capacity as assistant, advance agent, guide, and conveyor of baggage, also taking part in discussions, has offered me opportunities to form an idea as to the duties of county chairmen, and the qualifications in a speaker, before farmers' institutes.

My remarks are directed more specially to the inexperienced, and such persons as may have aspirations to become famous lecturers in the art of arts, the science of agriculture.

Before engaging as a lecturer, it would be well to learn the nature of the work and be prepared to adapt one's self to conditions, and possess the qualifications necessary to success. Coming during the winter months and the most inclement season, during all sorts of weather, when it is blowing and snowing, cold and rainy, long drives over bad roads, meeting good accommodations and the reverse, in warm rooms and cold rooms, among all sorts of communities, with plenty to eat, as a rule, generally well prepared, sometimes very indifferently, it is not always the most pleasant occupation. It is not becoming to the supercilious nursery-raised person brought up in luxury, comfort and ease, used to all the delicacies of high living, with servants at command, used to wearing kid gloves and fine toggery, and accustomed to the use of cut glass and silver spoons from infancy.

The perfect institute lecturer has not yet been developed. Life is too short to learn all the sciences relating to agriculture, and

practically but little of the numerous branches belonging to the art. A few essentials are a combination of theoretical and practical knowledge, the faculty to express it intelligently in plain terms, without straining oratory or eloquence, avoiding redundancy and circumlocution. The long-winded essayist or speaker is an abomination before the Lord, and before a farmers' institute. Half an hour is usually long enough to discuss an interesting topic, and if not interesting and instructive, it is twenty minutes too long. For an evening lecture on a literary topic longer time may be permissible, provided the audience is entertained and show appreciation, but to be subjected for ninety minutes to a collection of meaningless phraseology, a mere play upon nouns, pronouns, verbs and adjectives, conjunctions and interjections is almost beyond endurance, and no wonder that restlessness, yawning and expressions of "Oh, Lord," become audible in the audience. A certain degree of dignity, modified by modesty, is desirable, and accompanied with reasonable enthusiasm and good looks are captivating attributes. The speaker should possess integrity, not despise labor, be a cultivator, harvester and husbandman all in harmony with the work of the present day farmer.

Being a voluntary act on the part of the would-be-institute worker, it is optional with him to engage or not with the Department and it does not entitle him to assume special importance because of an appointment, and expect from communities treatment better or worse than is accorded other traveling men and itinerants. It happens sometimes during the institute season that contagious and infectious epidemics prevail, and thoughtless persons carrying contagion subject speakers and audience to danger about which county chairmen may be entirely ignorant. There are instances also in rural communities where a lot of young people gather for amusement after the meetings close, and by dancing late into the night creating much disturbance, when quiet and rest are desirable. These are a few of the contingencies encountered, and while somewhat annoying, we should be reconciled with the thought that when the young generation assemble in mutual enjoyment, the dangers of race suicide are somewhat remote in agricultural communities at least.

Like missionaries going into heathen lands, to brave the dangers, climatic changes or to be consumed by cannibals, the institute worker should be reconciled to his fate, and bear the burdens as a true hero without complaining to the Deputy Secretary, who has troubles of his own. All the county chairmen under whose jurisdiction it was my pleasure to be assigned have been kind and considerate and my co-workers congenial, generous and self-sacrificing. A speaker should not be condemned if through playfulness, hydrogen

and oxygen are substituted for *spiritus, fermenti, puri*, or for pinning up the sleeves and body of a night garment for another, because he may be ignorant of the usefulness of the one, and the utility of the other through inexperience.

Our work should be directed to the aid of the less informed, those honest, industrious people whose opportunities are limited, and to those benighted sections where modern methods have not been introduced, where ignorance and superstition go hand in hand, where signs of the moon and stars are consulted, where cattle are bewitched and troubled with wolf tail and hollow horns, and in fact an array of ridiculous notions prevail even to the cutting of hair of those who have any to cut.

There are a few up-to-date farmers in every community who learn, of their own volition, the things institutes are designed to teach. These are, however, not the ones needing instruction so much as do those of the elementary class and the classical instruction for the benefit of a few graduates who could be omitted without detriment to the cause. Whatever we may teach let it be what Dickens in "Hard Times" calls facts, facts, hard facts, and let them be verified facts and not preconceived ideas based upon improved theories. How to do work more easily, more economically, obtain better profits and get and keep more dollars, concern the average farmer more than any abstract science in existence. If the intelligence of an institute audience would at all compare with the highly intelligent audience gathered here, then the theory that only the highest class of scientific talent could impart the necessary instruction would hold true, but this generation at least, can receive useful information from those trained under the old curriculum, the three R's, "Readin,' Ritin and 'Rithmetic," seasoned by experience. The production of large crops alone does not conduce to the prosperity of the farmer, as is evident from the crops of cotton, apples and potatoes produced last season for which unremunerative prices were obtainable except in very favorable situations.

Finally, I will be frank to state that my humble services are not given out of charity, simply, and until I am informed by the Department that any of those engaged do not promptly make out vouchers and accept checks, I shall remain of the opinion that the rest of those engaged find it more congenial than milking cows, attending stock and marketing produce. Let it not be understood that I am ridiculing or condemning science, because I know its usefulness and value.

To illustrate my meaning, let me cite the occupation of the baker who supplies you with bread or even your good wife who can bake it better than any one else, yet in many cases those who produce

good results never heard of the formula, or yeast plant, and know absolutely nothing about the chemical processes accompanying the rising of the dough, excepting that a quantity of yeast and a certain degree of warmth are requisite to obtain palatable bread. Figure out, illustrate, bring specimens of insects, fungoids, root galls, black knot, etc.

MR. LIGHTY: Mr. Chairman, I don't know anything about the proceedings; I just came in.

The CHAIR: I will state for the information of the gentleman, that each speaker has two minutes to air his views, enter his complaints or anything of that kind.

MR. LIGHTY: Well now I understand from the Chairman, that the county institute managers have had some time, and now the lecturers have some time to kick or enter their complaints. I have nothing to kick about. I can give you my idea with reference to institute lecturers in a very few words. In the first place, the lecturer wants to know what his mission is, and then he wants to fully and entirely prepare himself to perform that mission, and then he wants to perform it effectually. If he does that, I believe he will make a success of it; he must be sure that he knows what he is there for, and he must proceed along lines that are definite, intelligible and practicable. If he does that, I am sure he will fulfil his mission and give good satisfaction.

MRS. MARY A. WALLACE: Mr. Chairman, I just came out to let you see your little sister. I am very glad to be with you and I want to thank you all for your kindness to me. I hope that this year there will be an addition to the family and you will have more sisters. There is a lady here that I want to present, and I am very proud that she is from Western Pennsylvania also. I would like to introduce to you Mrs. Orr, and ask her to say a few words to you.

MRS. ORR: Mr. Chairman, Mr. Orr knows that it will be impossible for me to say anything in two minutes. The subject of the meeting last evening was education, and I have watched it all along, and ever since I have observed it, I have become impressed that the whole question lies right there; that you must educate. You must educate your children; you must educate your sons and daughters, and you must educate your wives, gentlemen; you must educate them as you would educate yourselves. I say educate your farmers' wives so that they may become agricultural wives.

When at the World's Fair, which was a splendid event, celebrating one of the grandest of our historical events, the acquisition of the

Louisiana Territory, and as we went into that great exhibition, right before us lay the wonderful rose garden where there were sixty thousand roses cultivated. We went into Agricultural Hall and in that place there was a wonderful display of the great things of agriculture. I wish I had time just to touch upon two or three things that I saw in that agricultural palace, as they called it, that immense building covering over 23 acres of ground. The thought came to me that agriculture after all, is the very greatest of pursuits. We passed from Agricultural Hall and there standing out against the beautiful blue sky, for it was one of those clear days in the typical climate of St. Louis, and we looked up and saw on the top of one of those wonderful buildings, the majestic figure of Peace, and she spread her wings over the whole world.

(Mrs. Orr then reviewed at considerable length the history of the Louisiana Territory, and gave a very interesting description of what she saw in the dairy department, and spoke of it as especially an attractive educational feature.)

MR. MARTIN: We regret very much the flight of time, but the hour of twelve o'clock seems to have arrived. We have listened to very much instruction, which has been especially valuable to me in trying to arrange the affairs of the farmers' institutes of Pennsylvania. I shall be interested in reading over the record of what has happened during the past two hours.

Meeting adjourned to one o'clock.

West Chester, Thursday, May 25, 1905, 1 P. M.

Mr. M. N. Clark in the Chair.

The CHAIR: It has been arranged to take up No. 2 on the program for yesterday afternoon at this time, on the subject of "Poultry Breeding and Specialty Breeding," by Mr. T. E. Orr, of Beaver county, Pa. Mr. Orr will now address you.

(There were upon the platform a number of coops containing specimens of fowls used by Mr. Orr for the purpose of demonstration during the course of his address.)

MR. ORR: Mr. Chairman, the stenographer just asked me a moment ago if I had a typewritten copy of my talk. I want to say to you that I never had such a thing. The only sentence I had prepared was this: "Ladies and Genetlemen: I congratulate myself that I have for this afternoon a chairman who is a clergyman and, therefore, he will appreciate the merits of chickens." Now that would have been for the chairman of yesterday, but the chairman of

to-day is not a clergyman, but I am glad to know personally that he is one who does appreciate the merits of the old hen, so that I feel, on the part of the chairman at any rate, this audience will have his sympathy and co-operation in anything that we may say.

Mr. Orr then spoke as follows:

POULTRY BREEDING AND SPECIALTY BREEDING.

BY T. E. ORR, *Beaver, Pa.*

The subject for this afternoon is "Poultry Breeding and Specialty Breeding." It is a subject that is entirely too large for anyone to attempt to discuss thoroughly within the time limits allotted.

Poultry breeding does not differ especially from other lines of live stock breeding in many particulars; it does differ in some, at least in this: You can see the result of your work sooner. You don't have to wait four or five years to know what the result of a certain cross of blood may have given you, as you have to do in the case of the horse or the cow; it will not require so long to show all the characteristic marks as shown in the dairy cow, the merino sheep or the thoroughbred horse. As I said, you see the results more quickly, much more quickly than if you attempt to build up, if you please, a herd of dairy cattle, or beef cattle or road or draft horses. To do that, you have to wait a long time before you see the result. In poultry breeding, whether you breed on a fancy basis or on a commercial basis, you reach the results that naturally come from the breeding of poultry, within a comparatively short time, and it seems to me that there is no topic that you can present to your people in your counties that should be of more interest than the breeding of poultry, because of the fact that you achieve returns more quickly that ought to be satisfactory to the man who wants good returns for his money. In fact, I believe that there is no line along the whole sphere of agricultural industry that has a market so ready to receive everything that you are able to produce, and I want to say to these farmers of Pennsylvania that the great State of Pennsylvania does not produce one-fifth of the poultry and eggs it consumes. That is true of two great states, Pennsylvania and New York. The city of New York, that great market, to say nothing of Philadelphia, under whose shadow we now sit, the city of New York

consumes more eggs than the great State of New York produces. Now where does the other four-fifths of the poultry consumed in the states of New York and Pennsylvania come from? They come from the West. We are importers where we ought to be producers.

Within a hundred miles of Pittsburg I know of a county-seat grocer who has used in a single season three carloads of eggs that he imported from Chicago in order to supply his people, and many of them were sold to the farmers of the surrounding country who ought to have produced them instead of importing them for their own use. There is a ready market, I say, for all that you can produce and the business is one, I will not say that anybody can learn in a moment—it is not true that any superannuated minister or school teacher can take hold of it and immediately make a profit out of it, because it is not a business that does not require the very best of care in order to make it a success, but almost anyone with reasonable effort and care should be able to succeed well enough, and to produce poultry and eggs enough for the family table, and something besides.

Some of the states are giving more attention to the subject than is Pennsylvania. I might call your attention to the fact that the great State of New York is holding poultry institutes lasting two days, and they get the best speakers obtainable. They seem to be getting profit as well as pleasure out of it. The State of New York has made rapid strides along this line in the hope that they will be able to supply that which they have for years been importing.

In discussing this subject, the subject of poultry rearing and egg production, I am not referring so much to the man who lives in a village or a town, but rather to the man or the woman who lives on a farm. No village man or woman has the opportunity enjoyed by the farmer who lives out in the country somewhat isolated from his neighbors. In fact, the farmer ought to be the one who raises the best horses, the best cattle, the best sheep, the best swine, and he also ought to have the best poultry.

I think it is not egotism on my part to say that I am fairly familiar with poultry conditions from New England and Florida to Texas and over the great Northwest, for I have studied poultry conditions in all those states with considerable care, and I want to say to you that I do not know of a man who has made a profit two years in succession who has done so with mongrel and low-grade fowls. It has always been done with pure bred or high-grade flocks.

Seeing Mr. Franklin Dye, the Secretary of Agriculture of New Jersey here, reminds me of an incident that occurred over in his state, when I was talking on the subject of uniformity of flocks, and we passed along in a carriage in which Mr. Dye takes his trips, and

as we were riding along, he said as we approached a farmhouse, "Here is a flock that will please you," and of course I was all anticipation, and I looked out with pleasure, and what sort of a flock do you suppose I saw? Well, Mr. Chairman, I saw just one hen, and it was all alike.

I want to say again that it is not the mongrel or the low-grade fowl that will produce the results we are after, and if you want to start a flock that will be profitable or if your wife is going to buy a setting of eggs for hatching, that is not the sort she should select. It is the man or woman that has some good variety that is going to succeed. And right here I want to suggest that in this poultry business there are more varieties and more opportunity for selection than in any other line of live stock industry, for of those bred up to the standard, there are some 125 varieties of pure-bred poultry and there is absolutely no success to be looked for from the cross-bred mongrel flocks that adorn, if I may use the word, so many of our farms in Pennsylvania. I want to repeat and emphasize that point.

I know of a wholesale grocer in the city of Pittsburg whose business is eggs largely and he handles three hundred cases every day—every business day in the year, and he pays out for eggs half a million dollars each year, and not a dollar of that half a million goes to the farmers of Pennsylvania. It goes only to the State of Indiana, where these eggs are bought and stored and shipped in to him every week in the year. So there is a market and an opportunity, and we have it right here in Eastern Pennsylvania as well as in Pittsburg in the western end of the State. You have here the New York market close by, also Boston, Philadelphia and Baltimore. You find a man who is able to supply any one of these markets with a good quality of fresh eggs and he will have no difficulty in making a contract for all he is able to produce, no matter what may be his facilities. You take a man who can guarantee that he can produce and provide so many dozen eggs a week in September, October and November and so on, through the season, and he is the man that can command his own price, will have no trouble to get fifty cents a dozen in New York in the winter time and not less than thirty cents a dozen at anytime, because they are willing to pay down there for the kind of eggs they want, first class, and only first class. So this great number of fowls affords you an opportunity to select whatever kind you may like. You may have a preference for one variety while somebody else may like another.

Our American standard of fowls is divided into a few great families. Our classification is first, families or classes, second, breeds, and third, varieties. We have the Asiatic families—all those large

fowls with feathered shanks and feathered legs belong to the Asiatic family—they are divided into breeds, the Cochins that we have here and the Brahma. They are sub-divided. There are quite a number of varieties of Cochins; the Partridge-cochin is one variety of the Cochin family, and there are several others, all breeds of the Asiatic family. To come to the American family, we have the old-time Java, two varieties, the Plymouth Rock, three varieties, the Wyandotte, seven varieties, all belonging to the American family. Now these fowls of the American family are clean shanked birds—sometimes they have a few feathers when you do not want them, but they should be clean shanked. All of them are fowls that will hatch and rear their own young. Then we have the Mediterranean family, producers of the kind of eggs that are liked in New York city. We in Pennsylvania do not discriminate particularly in this matter of the appearance and color of eggs, but Boston will pay from one to three cents more per dozen for brown eggs, while New York will pay from one to three cents more per dozen for white eggs, while in Philadelphia they will pay more for eggs that are all alike. Eggs that are white and uniform in size, they will pay more for them, simply because they are uniform. They do not discriminate so much in the Philadelphia market or Pittsburg market as to whether they are white or brown eggs. Our chemists tell us there is no difference in the quality; but if the bean eaters of Boston will pay three cents more for the eggs of the Plymouth Rock that are brown, by all means let us send our brown eggs there. If the New York people like the white eggs, that is the kind to give them. Those people who are getting sixty cents a dozen in the New York market are getting it because they send them just the kind of white eggs they want there. They will actually take sapolio and clean them rather than to send them eggs that are not perfectly white and clean.

As I said, we have a great chance to select our variety according to our preference, whether we would like to breed those of the Asiatic or American families. The first pure bred flock I ever saw was probably of the light Brahma or Cochin, the first pure bred flock, the first uniform flock that I ever saw in Western Pennsylvania was a light Brahma.

We have produced some wonderful fowls since then that are worthy of our attention. They differ from the Brahma in one or two particulars. I am very fortunate in having here a pair of fowls furnished by one of your citizens, Mr. C. C. Townsend—a pair of black Langshans, all of you who have dressed Cochins or Brahmas know that the skin is yellow. If they are fed upon corn they will

be very yellow, but here is a fowl that is entirely different from that. It is a bird that comes, we suppose, from the same country, from the Langshan hills of China. To those who have not become familiar with the Langshan characteristics I might state, that this bird, of all our varieties, comes nearer to being a turkey in quality of skin and flavor than any of the others that we have. These are the Langshans; it is a little hard to bring them in before an audience this morning.

These fowls come in two colors, the white and the black, but both of them have a peculiar skin, not found in any other of the Asiatic varieties. If you will turn up the wing you will find that the skin is of a pinkish white. If they were yellow they would be thrown out of the show-room entirely.

When you come to roast that fowl—dress it out—you will find that the skin is of a pinkish white indicating the difference between the Asiatic fowls and the American varieties. The Brahmas, Cochins, also the Plymouth Rock, are rather yellow skinned, and have yellow shanks.

If you go into the London market or the Paris market or especially the New York market, you will never see a French chef—one of those chefs of the great hotels in New York, selecting any of those yellow shank fowls if he can buy one that is white skinned, because of the fact that he knows that a yellow skinned bird is a thick-skinned bird with coarse fibre—a bird whose flesh is of a coarse fibre, and is also accompanied by a less sporty quality or flavor. He knows that with the thin skin you have always a fine texture and a superior quality. Here is the bird (exhibiting one) that comes nearer to the American turkey in quality than anything we have. The nearest approach to it now is an English variety recently introduced. All my life I have been a fancier of the American varieties, and as I have said, the American bird is good enough for me, but I want to say that we are sitting at the feet of people who have forgotten more than most of us know about this subject of poultry.

(Mr. Orr exhibited the fowls to the audience, and said): This hen illustrates a variety of fowl bred for show purposes. You will note these beautiful penciled feathers, each feather marked with two shades of brown, and these circles running around each feather. We have in this variety what is known as the Partridge-Cochin. These birds are inclined to be rather broody. If you want to have early birds, you get them to lay early and they will become broody and will furnish hatching for your early birds. Notice the feathering on the shanks and on the heads. The English people are surpassing us in this variety, having birds so heavily feathered you will hardly recognize them. They exhibit a great mass of

feathers. (Mr Orr exhibited to the audience another specimen of the fowls taken from one of the pens on the platform.)

Orpingtons were originated by Mr. William Cook, of Orpington House, England. He has been a lifetime in developing fancy fowls, has really spent a lifetime in this occupation. His life ended last year; he passed away.

Mr. Orr spoke of Mr. Cook as having risen from the position of a coachman in England, and having devoted his life to the business of developing fancy breeds of fowls, beautiful in form and marked in qualities. He stated that when Mr. Cook passed away, he was said to be worth hundreds of thousands of dollars which he had acquired in breeding these birds. He originated and developed some half dozen varieties. Only one has been admitted to our standard but the others are likely to be admitted in the near future. Here we have that same quality of flesh, nice white flesh, thin skin, shanks are the same—pinkish white shanks, body full, round and long, and with a quantity of most excellent flesh.

Mr. Orr spoke of the folly of breeding the ordinary dung-hill fowl of the hit-or-miss variety, and of the necessity of uniform quality for marketing purposes. He said that the American people were beginning to discriminate in the matter of uniformity and that it was necessary to pay attention to this quality if one desires to achieve success in poultry breeding.

He spoke of having been in Missouri last year where he had a practical illustration of the value of uniformity when a farmer came in and offered to a buyer a lot of ordinary mixed chicks, and the price offered the same was twelve cents per pound. Later, another farmer with his wife drove up to the same buyer's place of business in a spring wagon, with a fine lot of chicks of uniform size and color, for which the buyer offered fourteen cents, and explained to Mr. Orr that the reason he did so, was because of their more marketable quality, due to uniformity of size and color, and the same principle applied to eggs that were offered for sale, and the buyer stated that if he didn't buy these chickens and pay the outside price, they would be sent to the Kansas City or Chicago market where they would find a ready sale and if he, the buyer, did not hold himself ready to pay the price, he would lose the trade of the people offering them to him for sale. He said the people demand uniformity of quality and they do not want to guess at it, they want to know it.

(Mr. Orr exhibited another bird from the lot on the platform.) We have here a bird surpassing any of our American varieties in quality and flesh. It stands next to the Langshan in that peculiar white flesh and in that desirable turkey quality of which I spoke in connection with the Langshan. It is the Buff Orpington of which I spoke a few minutes ago,

Mr. Orr spoke of his having brought into the house at his own home more than once, two fowls of different varieties that his wife might make a trial of their qualities by roasting them together so that they might determine the difference in their eating qualities. He said that members of his family did not hesitate a moment in expressing their preference for the Orpington because of the thin skin and the abundance of well-flavored turkey-like flesh. He recommended that more attention be paid to the quality of the flesh in raising poultry; that in selecting the varieties for breeding purposes it would be a matter of cold dollars and cents to pay attention to egg-producing qualities and to the demand of the markets as to color and quality of the flesh as well as its quantity. He pointed out the similarity of the principles of breeding poultry for the market to those recognized in the breeding of the beef steer, and said that farmers who raise poultry should address themselves to an intelligent study of what is required along these lines. He pointed out and illustrated the fact that among fowls profitable for the farmer to raise, some are of the egg type in formation and others are of the flesh-producing type, and he called particular attention to the difference in shape of these respective types. He said that one of the advantages enjoyed by the breeder of poultry over the breeder of live stock—cattle or horses—lies in the fact that results are so quickly known, that the breeder of poultry would soon learn the result of his attempts to produce certain types which would enable him to profit by his experience.

Mr. Orr stated that he had no Plymouth Rocks to exhibit and expressed regret that such was the case. He stated that Mr. Temple had the promise of some for the purposes of illustration, but for certain reasons was unable to obtain them.

Mr. Orr stated that he wished to acknowledge his indebtedness and return his thanks to the people who so kindly furnished the fowls present on the platform for the purpose of illustration, mentioning particularly Mr. Townsend and Mr. William Moore, who furnished the specimens of Langshans, Buff Orpingtons and to Mr. Grove, of Philadelphia, who furnished the pair of Partridge-Wyandottes.

He stated that the Plymouth Rocks were found all over the United States from Maine to California, more numerous than any other varieties, while in the show-rooms there were more of the Wyandottes than any other variety. He said the Plymouth Rocks on farms in the country are the most popular birds in America. The Plymouth Rock has three recognized varieties, while the Wyandotte fowls have seven different varieties, all recognized as standard and one not yet admitted to the standard.

Mr. Orr illustrated the characteristics of these fowls by a prac-

tical example held up before the audience indicating their different points of conformation and peculiarities and characteristics of flesh and egg production. He said that the characteristic of the Wyandotte hen is a short body, short of shank, the hen standing close to the ground. Some one has said that Hogarth's line of beauty is not found in live stock as thoroughly developed as it is in the Wyandotte bird, which is notably a bird of curves and not of angles. When you get a bird with angles, you get a bird that does not prove to be very satisfactory in egg production.

(Mr. Orr produced one of the specimen birds and stated that it had been brought there from a distance of 350 miles. He then exhibited the points of this bird and described its characteristics, saying it belonged to a line that had been bred for 25 years for a particular purpose. It was especially intended to illustrate a principle of potency in inbreeding with special reference to egg production).

I have no use for miscellaneous uncertain breeding, but I want to say to you that what has made the Jersey cow what it is to-day and what has made the thoroughbred horse what it is to-day is found illustrated along lines following the same principles of breeding as we find in the American fowls, in their shape and outline, more fully than can be seen in any other lines.

You will observe a great egg type in this bird, if you please (referring to a bird which he then held in his hands). She is a representative of the family which has been a great egg producer. This particular bird has been a good producer beginning at five months of age, her mother and grandmother before her were also great egg producers. Her mother was shown five years ago.

(Mr. Orr spoke of the advisability of selecting such poultry stock as would convert the feed given them into something which would be worth more than the feed, either eggs or marketable and well chosen flesh-producing breeds.)

(Referring to a bird held in his hands.) This bird is a great egg machine. I think it is not improper for me to say that there are some varieties that will lay twice as many eggs as others. I have two strains of white Wyandottes, one of them is here, the other one is not here; one will produce twice as many eggs as the other, and that is a matter of breeding, of specialty breeding. It must be followed up successfully and if so would result in making many a dollar now lost. (Taking out another bird.) This bird in shape is very much like a Plymouth Rock; the Plymouth Rock is medium in length of body, while the Wyandotte is short; this hen is long, too long in body to be in typical shape. It is characteristic of this strain to produce eggs rather than shape; they all do it, and I know

by personal experience there is no type that will produce more eggs. The little brown hen that I showed you a moment ago, as I said, is a type of this and a good one, but I want to show you here for a moment and to call the attention of all those here who may be interested in this subject and who care to study that matter of type to a hen I have here, if you were close to her you would readily see a difference of type in her shape; it is a good egg type, too. Those who can see will notice that this hen is shorter in body very considerably than the other one.

Now I am not one of those who believe that you can determine all the characteristics of a hen by the outside appearance. This hen, however, has proved a most excellent egg producer (referring to one held in his hands).

If you are going to make a business of producing fancy birds, if you are going to try to produce a show-bird, you want to breed to that type, select what is characteristic of those varieties. I want to call your attention to the egg variety particularly, that wide, broad, deep conformatin of the rear part of the body, the general typical shape that you want to get if you desire to have very great egg production.

We have herè a hen of a type that would seem to indicate very satisfactory egg production. She is from a pen of my own, and I want to say to you that they have not earned their bread for the last three months. If you look at her you see she has all the indications of a good egg type, and yet as I have told you, she has not earned her feed for the last three months, so I say the type won't always hold. I brought this hen here for that particular purpose, to illustrate that fact and to call your attention to it. As an egg producer, she is not worth that (snapping his fingers).

The only way that you can reach success is to follow up your strain closely enough, and keep your record of them so accurately that you will be sure to know which ones do produce. The man who says he can tell by the type, by the shape which one will produce the most eggs, is like the man who says he can tell by the shape of the egg whether it will produce a cockerel or a pullet. He can't do it.

(Taking out another bird and exhibiting the same.) We have here a small bird, a bird that of almost all the birds of this variety is most active; they are all Wyandottes and great egg producers, great rustlers; you turn two flocks out in the morning of the same day, and here is a bird that will rustle and get over the hillside and be over on the other side while some of them, particularly these Partridge-Wyandottes will be lying around waiting for the next feed. There is something in the strain of the bird that shows egg production and meat production; still you must study it.

I want to say one thing, and that is on the subject of fresh blood; something which is doing more harm to flocks in the State of Pennsylvania than any other one thing. Select your best, breed your best, and mate them if you have suitable selections, breeding in the same strain but not too closely related. For example, if you have been breeding barred Plymouth Rocks for four or five years of the Thompson strain and you think you ought to have fresh blood, go back to Thompson tell him what you have, and get something along that same line.

Having bred one of these varieties for fifteen years, I was impressed with the idea that possibly I might be breeding too close, so I purchased two male birds mating same with ten hens, which represented about the average of my flock, and as a result I got the veriest lot of mongrels that I ever had on my place. You don't want to do it; you don't want to run the risk; you want to start at the top; don't start down at the bottom. Take advantage of what somebody else has done; don't ignore the work that has been done by others and throw it away and attempt to do something yourself that will only lead to failure.

These Leghorns are the great producers of white eggs; all of the Mediterranean varieties produce white eggs, if you keep them warm enough, but you must have a house free from the wind in winter; you must have them in a tight house in winter. You don't need artificial heat to breed them. All over the State of New York they are breeding them by the tens of thousands without artificial heat.

I hope that I have succeeded in calling your attention to a few of these points which are of importance in the breeding of poultry. Now I would say to you, give that boy or that girl a chance on the farm to have something of his own or her own, something that every member of the flock will be as nearly alike as possible, something that will represent the sort of poultry that the people will want and something that is worth more money than the cost of the feed which you provide for them.

MR. DYE: Mr. Chairman, I don't want you to think that in all the flocks of the State of New Jersey there is but one bird that looks alike as my friend Orr seemed to intimate. If he will come and travel with me over the State of New Jersey I can convince him that we have very many over there that it would pay him to visit. I wish also to state that I have enjoyed this meeting very much. It has been one of great instruction and pleasure to me.

DEPUTY SECRETARY MARTIN: Mr. Chairman, we have been especially favored at this time and honored by visitors from our neighboring states. Yesterday we announced the visit of Mr. Dye,

of New Jersey, and of Mr. Agee, of Ohio. Now to-day we are honored by the presence of Hon. W. L. Amoss, Director of Institutes of our neighboring State of Maryland. Mr. Amos will please come forward and let us hear from him.

Mr. Amoss spoke as follows:

ADDRESS.

BY HON. W. L. AMOSS, *Director of Farmers' Institutes, Maryland.*

Mr. Chairman, Ladies and Gentlemen: I came here as a student, as I suppose you all are at a normal institute. I came here to learn. My opinion is, that in doing institute work, we are not conducting a successful institute unless we are able to present to the people something that instructs and interests them, so if I have not something to give you, I had better sit down, or I am taking up valuable time that might better be applied to other uses.

Referring for a moment to the line concerning which I heard several addresses this morning as to the methods of doing institute work, I always think that it is my own fault if an institute is not a success, because I act as chairman at all our institutes in our state. We have of course a different system from what you have. We have what might be called the one-man plan. We have a number of local organizations and local institutes, but I think there is a place for the state institute. The state institute can bring men to discuss subjects and study your conditions and supply your needs better than can the local institute. A local institute certainly has its field in bringing out local talent and discussing local interests from your own standpoint, but the state institute has a broader field in which to operate, and I believe is certainly capable of doing a great deal of good by bringing attention to new methods, so there is a place for the state institute, and a useful place in comparison with the local institute.

I like your system, and in some places it would work, but in other places it would not. I believe that it is necessary to adapt yourselves to your conditions, and to meet those conditions, and so if, with all the opportunities that the institute director has of getting information and supplying the wants of that immediate section, if he does not succeed in that, it is his own fault. I think that if I cannot carry on the work along these lines, and if I cannot find and supply what is wanted in a given community to interest the

people there, then it is my fault, and I am a failure. I have never met the man or woman that was not interested in something, and when I go to any part of my territory to conduct an institute, I always try to meet the representative men and women of that section, and then find out what they are interested in and supply their wants.

I have appealed to them in this way; I have gone into some places where they have seemed indifferent or have seemed set against the idea of holding an institute, and determined that a meeting should not or would not be conducted, and I have put it in this way. I have said to them: Now the state has appropriated money and has placed it in my hands to be spent in your community, and I have come here to ask you how I can spend some of that money in such a manner as to help you people with that money. Now when the proposition is presented to them in that way, if you show a man that you are trying to help him, and have money to spend in his interest, he is going to be a very narrow-minded man if he does not take hold and do something. In that way I have brought men to the institute and to my assistance that had not come before. As to the methods of doing the work, why that depends altogether on the conditions that you meet with at the place where you are. If I was to come here to conduct an institute, I should conduct it altogether differently than I would if I should go into some of our lower counties which are decidedly southern in every particular. I went into a town in the lower part of our state where we had called meetings several times, with the result that we had a very poor attendance, and it was rather discouraging to try to conduct an institute. Following the advice of Mr. Wing, who assisted me at one time in that state—he was with me when we had a splendid program and a very small attendance—I tell you this to bring out some of the characteristics of the man; some of you may know him. He was talking to an audience of only fifteen. We had a splendid program, but somehow the people did not seem to manifest much if any interest in the institute work. Finally he stopped and said, “If you are going to sleep, I am going to tell you a bear story.” He said, “Amoss, I wouldn’t talk to these farmers anymore. What’s the use?” I made up my mind that the next time we came to that place we would make a success of it, so when the time came for us to hold a meeting there again, I determined to secure the interest of the people in some way. We went around and met the ministers of the town, and explained to them what an institute was, what its object was, and asked them what they would recommend us to do to help their people and interest them. Then we went to the leading lawyers and then to the business men. By that time the day

was exhausted. They took the work up and the result was a splendid institute. When we came into the town it was snowing and raining, and the slush was six inches deep, notwithstanding we had a good audience during the day, much better than it had ever been before. We were told that it was useless to try and conduct an institute there at night with the slush as deep as it was, because the people could not get out. I said, "Your town is small, why can't you haul your people to the institute?" I said, "I will be over at the hotel, and if you want any help, I will help you." We had a lecture on domestic science on the program for that night, and we telephoned to everybody in town and got teams and hauled them there, and we had an audience of 110 there that night.

I only mention this as one way that proved to be successful in stirring up an interest in a place that had hitherto been indifferent. That is one way. There are other ways that may be adopted, but I have simply given this to you so that those of you who are studying new ways, may perhaps get some ideas from it.

I heard you say that you would like a two-day institute. So do I, but you can meet more people with a one-day institute. It is a question whether it will do as much good as a two-day meeting. I am somewhat undecided on that although I have managed both. I know this, it is very hard on the men; I don't believe in over-working the men; you want them to do good work; want them to have all their faculties and abilities in good vigorous condition; we don't want them over-worked, and some cannot do their best if obliged to work two days in succession. Our work on the whole for this last season has been very satisfactory. In this corn specialty work we are following some of those Western states. We took two men and had them lecture from one end of a car, stopping at such stations along the line of the railroad as we thought we could get audiences. The railroad assisted us in this, as a rule we took only thirty minutes for these talks, but sometimes we allowed forty-five minutes. That is, we would run in and out again in thirty minutes, and the point in doing that work is, you want to make it a clear-cut and concise presentation of the facts that you want to convey to the farmer. You must put it in such shape as to give him just what you want him to know. These trains were well patronized and our state has asked for them all over the state. It has been quite a hit in institute work, and for some purposes I think it is one of the best plans for the carrying on of institute work that we have met with.

MR. HALL, Potter county: Mr. Chairman, the advertising matter that the Department sends out, one part of it is in the form of large posters, which would reach from the flag (referring to flag on the

wall) down to here. The first criticism I want to make of that, or the first suggestion that I want to offer is this, that the size be cut down one-half, because it is hard to tack it or to make it stand in the wind. Now as you all know, the State is divided into so many sections, and it is known who the State speakers will be. Now instead of leaving blanks to be filled in, the suggestion that I want to make is, that the names of the State men be printed in, and no blanks left, so that we will have a neat and complete poster.

I want to partially approve of the postal card advertising as it is sent out; we want a little change in that. It says "You are notified." Just leave the "you" out so that it can be filled in "you and your family" or "your friends," or something of that kind.

The CHAIRMAN: We will now take up the first number upon our program for this afternoon, "Doubling Crops in Market Gardening," by the Hon. R. F. Schwarz, of Analomink.

(NOTE.—It was understood by the stenographer that Mr. Schwarz would furnish a copy of his address for this Bulletin, but up to the date of going to the printer Mr. Schwarz had not been able to furnish the Department with the copy.)

(NOTE.—Owing to having met with a severe accident, Dr. I. A. Thayer, of New Castle, could not be present to present his paper, as per program, "Tile Draining: Why and How.")

The CHAIRMAN: We will now take up No. 3 upon the program: "Growing Early Vegetable Plants," by Prof. R. L. Watts, Scalp Level, Pa.

The following paper was then presented by Prof Watts:

GROWING EARLY VEGETABLE PLANTS.

PROF. R. L. WATTS, *Scalp Level, Pa.*

(The lecture delivered by Prof. Watts was illustrated so far as possible by photographs and actual plant specimens brought from his home. No manuscript was used and the paper which has since been prepared discusses briefly some essential points which were not considered in the lecture on "Market Gardening," given at the last Farmers' Normal Institute, published in the Proceedings of the Normal Institute Bulletin, No. 131, page 191.)

Importance of Early Vegetable Plants.

The importance of early vegetable plants is not half appreciated in most localities. Nine-tenths or more of the farmers of our State do not know anything about the luxury of having real early vegetables for their own tables, excepting a few which may be grown without the use of glass. Tomatoes are not usually found on the farmer's table until about the first of September and many do not have ripe tomatoes until time for destructive frosts. No vegetable is more wholesome or more enjoyed, and every possible effort should be made to have the vegetable during the longest possible period. It is not difficult to produce ripe tomatoes by the 15th of July in practically every section of the State, and earlier where the exposure, soil and climatic conditions are most favorable. Cabbage is not usually ready for the table until well into August or the first of September, and later on many farms. It is easy to have at least a few solid heads by the first of July. Celery is not usually ready for use until late in the autumn. This vegetable is noted for its health-giving qualities and should be grown ready for the table by mid-summer. We might increase the list of vegetables which may be had much earlier than is customary.

Thousands of farmers in the State grow vegetables in greater or less quantity for local or distant markets. What percentage of them reap satisfactory profits? Many may be well pleased with their results, but comparatively few make the business as profitable as it should be, and one of the most potent causes of small profits is that the vegetables are not really early. They do not reach the market until prices are down and the cream is gone.

There is another demand for early vegetable plants, and a very large one. Village and townspeople who have gardens are always willing to pay good prices for fine early vegetable plants. One or two farmers in nearly every locality would find the plant business, in connection with the regular farm work, desirable and profitable.

The Seed Supply.

Anyone growing vegetable plants for the market or for use at home should exercise the greatest care in procuring seed. He should be thoroughly posted on the most desirable varieties for his particular locality. He should know where to buy the best seed of the varieties he wants and not pay very much attention to prices. Buy the best seed, although the price may be high. Some seeds should be saved at home. This is particularly true of the tomato. No seedsman could place on the market and sell the kind of tomato

seed we have used this year. For instance, the tomato seed used on our farm this year was taken from the finest, earliest, most perfect specimens that were selling at wholesale prices for three and four dollars per bushel. Could any seedsman afford to do this? He could if the gardeners and farmers would pay two or three dollars an ounce instead of fifteen to thirty cents. When seed is purchased it generally pays to buy from the seedsman who has introduced the varieties wanted. He usually exercises more care in the production of seed of the varieties in which he is particularly interested. Good seed means fresh seeds, of the best types, plump, large and of high germinating power. A careful test of the germinating powers of the seeds should be made before the proper dates for sowing.

The Soil.

The soil for growing early vegetable plants must be considered physically as well as chemically. In fact, the physical composition is of greater importance and demands more study than its actual supply of plant food. The conditions of the soil, mechanically considered, must be such that it will not bake seriously and that the drainage is perfect. This condition may be secured in any soil by adding the proper amounts of vegetable matter or manure and sharp sand. A very practical way to do this is to haul the soil to a convenient spot, spread about eight inches deep, add four inches of manure free from coarse litter, and a couple of inches of sharp sand. (If the soil is naturally loose, sand will not be necessary.) Let the soil and manure remain in these layers until soaked by rain and when sufficiently dry, plow at intervals of a week or two, harrowing thoroughly to incorporate the manure with the soil. This soil should be prepared before mid-summer, and late in the fall thrown into piles and hauled to the cellar, cave, stable or other storage house where it will not freeze. Preparations in the way of a liberal supply of soil must be complete before winter sets in or there will be trouble when the time comes to begin sowing seed.

There will be no occasion to worry about the chemical properties of the soil if it is prepared as explained above. A very small quantity of chemicals may be added but it will not be necessary. It is always desirable to mix lime in soil to be used in starting cabbage plants as a preventive of club root, and if there is reason to believe that the soil lacks fertility, pure bone meal, free from acidulated goods, may be used liberally with entire safety. No harm can result from making one-third the bulk bone meal. Of course this would be extravagant. A peck of bone meal or even less to a barrel of soil is sufficient for excellent results.

The Effect of Water.

Only experience teaches the gardener the effect that water has on the young plant as well as the soil and enables him to determine just when and in what quantity water should be used. We believe that the improper use of water has more to do with failures or poor success in growing plants than any other one factor, and it is most difficult to give positive instruction along this line. In general it may be said that so far as actual results are concerned water has the same effect as heat and plant food. That is, plant growth may be stimulated by increasing the temperature, adding more plant food or by the use of more water. If all these conditions are the most favorable for the particular plant being grown, we may expect perfect results. If any one of these three conditions is not right the effect in the end is practically the same. Suppose, for example, we are growing a tomato plant and it is not making the progress it should. The soil and atmospheric conditions are studied and it is determined that the soil contains plenty of plant food and an abundant supply of moisture while the temperature in the house or frame is too low. Heat is needed and when applied the plant starts off with new vigor. If the supply is too dry, although it is rich in the elements of plant food and the temperature is exactly right for tomatoes, satisfactory growth can not be expected until more water is added. Probably the supply of plant food has less to do in growing a good plant than either of the other two factors, for it is a wonderfully poor soil that cannot be made to produce an excellent plant if the temperature and supply of water are under perfect control. The grower should always keep in mind that water is the greatest key to unlock plant food and he can use this key at will. Plants soon become stunted when there is not a regular and constant supply of water, and over-watering has the opposite effect in producing a weak, spindling growth. Watering should be attended to regularly and systematically and the aim should be to maintain an even supply. This is especially important at the time of germination. A lack of soil moisture while the seeds are sprouting may cause a low percentage of germination, an uneven stand and stunted plants.

Dates for Sowing.

The proper dates for sowing vegetable seeds requiring glass are determined by the usual progress or advancement of the season in different sections of the State. Seeds for early vegetables should be sown from one to two weeks earlier in the southern counties and in the vicinity of Philadelphia than in the mountainous parts of the

State and in the northern counties. The dates when it is considered safe to transplant to the open ground must regulate the dates for sowing. In our own county of Cambria, it is not too early as a rule to set cabbage in the field by the 15th of April. The seed of early cabbage should be in the ground not later than the 1st of February, and a few days earlier is an advantage. It is too risky to set tomato plants in the field before the 20th of May, and the seed should be sown not later than the 20th of February when two transplantings are to be made before taking the plants to the field. Egg plants and peppers should be sown fully as early as tomatoes and earlier if you haven't a very warm place to keep the seed boxes. Sow celery, lettuce, cauliflower and kohlrabi at the time the cabbage is started.

Transplanting.

Transplanting is an absolutely necessary operation in the work of growing early vegetable plants. By sowing the seed thickly a very limited amount of space will grow a large number of plants. For example, it is an easy matter to start 1,000 cabbage or tomato plants in a flat 14 x 20 inches. When transplanted, not more than 140 cabbage plants should be set in this same size flat, and twenty tomatoes will be as many as can be set in the box if you want to grow fine stocky plants. It will be seen that a small hotbed of two sash is large enough to start at least seven thousand celery or cabbage plants, while ten times this number of sash will be required to care for the plants after they have been transplanted. Another advantage of transplanting is that the root system is enlarged and improved, and when the plants are taken out of the boxes carefully a considerable quantity of soil and manure clings to the roots which is an immense advantage in giving the plant a quick start. A large percentage of manure placed in the bottom of the flats before transplanting, or incorporated with the soil, increases the amount of material which will adhere to the roots.

Some vegetables, such as tomatoes, egg plants and cauliflower, always command high prices when placed on the market very early in the season, and it pays the grower to exercise special care in producing the finest possible plants ready for the field the first day that it is considered safe to place in the field. We have found in our own practice that it is the most profitable to transplant early tomatoes twice before setting in the field. The seed is sown on the greenhouse bench or in the hotbed not later than the 20th of February. In four weeks the plants will be ready for the first transplanting which is done on the benches of the greenhouse, allowing an inch and one-half, or two inches between plants. In

three or four weeks the plants will be three to five inches high and must be transplanted promptly or spindling plants will be produced. They may be set in flats, allowing from three to six inches between plants, or better, set in discarded berry baskets, cans or earthen pots. Where there is a large number of plants to be grown every year, the most satisfactory plan from every standpoint is to use earthen pots. The larger the pot the better the plant that can be grown. It is probably very seldom that it will pay to use larger than a four-inch pot, and the three-inch size is very satisfactory. A larger size makes much more material to handle, thus increasing the expense as four-inch pots cost at least one-third more than the three-inch size. For the earliest tomatoes, it is a decided advantage to keep the potted plants in a greenhouse or hotbed although most excellent plants may be grown by placing the pots in cold frames immediately after transplanting which, in this section, would be about the 20th of April.

(Notes on the construction and use of hotbeds and cold frames and the general care of plants are published in the bulletin to which we referred in the beginning of this paper.)

The following questions were asked during the delivery of Prof. Watts' address:

A Member: What depth of soil do you use in your greenhouse beds?

PROF. WATTS: About five inches.

MR. SCHWARZ: You have manure under that, don't you?

PROF. WATTS: We have a small quantity of manure.

MR. SCHWARZ: Excuse me; your plants are not usually as large when you put them in, are they? (Referring to plants exhibited by Prof. Watts—tomato plants.)

PROF. WATTS: No, they are not ordinarily quite as large as that; in fact, I would rather have a plant not quite as large as that; it will make a better plant than one larger.

The CHAIRMAN: Do you want your bone meal ground real fine?

PROF. WATTS: Yes, as fine as you can get it.

A Member: About what depth do you use for boxes?

PROF. WATTS: We use boxes just about like that. (Exhibiting one.)

A Member: That box is about two inches deep.

PROF. WATTS: Yes, just about two inches deep.

A Member: Do you find that box deep enough for the last transplanting?

PROF. WATTS: Yes, you will grow just as good a plant.

A Member: What do you consider the best early tomato?

PROF. WATTS: Maules Early is a splendid early tomato.

MR. SCHWARZ: Have you tried the Livingston?

PROF. WATTS: It is rather a different tomato from any that is on the market; I think it is a fine tomato.

The CHAIRMAN: We will now take up No. 1 of Wednesday afternoon program, which was deferred at that time on account of our visit to Mr. Kates' farm. We will now hear from Prof. Franklin Menges, of York, Pa., on "The Advantages of Corn Breeding to the Pennsylvania Farmer."

Prof. Menges read the following paper:

THE ADVANTAGES OF CORN BREEDING TO THE PENNSYLVANIA FARMER.

BY PROF. FRANKLIN MENGES, York, Pa.

I shall not discuss the botany of corn but simply say that it is a member of the large grass family, that the botanical name is *zea mays*, that it is an annual, growing, ripening and producing seed and dying in one summer, and that in the classification of farm crops it belongs to the cereals or plants producing a mealy seed which is prepared for food.

In discussing the subject of the advantages of corn breeding, it may be said that Illinois, which is a corn breeding state, produces annually nearly 400,000,000 bushels of corn and consumes 260,000,000, while the State of Pennsylvania, the second dairy state in the Union, produced in 1903 45,500,000 bushels, and in 1899 nearly 52,000,000. The crop of 1903 averaged 31.2 bushels per acre; the crop of 1899 a little over 29 bushels per acre.

About one hundred average size ears make a bushel and on an acre of corn, when the hills are 3 feet 6 inches apart each way, there are over 8,000 stalks with two stalks to the hill and under normal

conditions, should we raise a normal size ear on each stalk, we would have at least 80 bushels of normal ears per acre, whereas, with our present practices we have only a little over one-third of what we should have. The question with us now is how can we increase the yield and why is it that we have so low a yield and what can the corn breeder do to increase this yield. I think we are all going to follow the suggestions I am about to give, therefore, we will begin with the corn we are growing this year. The first thing to know is whether we have a corn suited to our soil and climate and select seed corn from this variety.

Every corn stalk has an individuality, like every animal, a something in which it is superior or inferior to others, all of which are apparent to the studious and trained observer. The stalk may be devoting its energy to the production of an enormous stalk with a small ear way beyond the reach of an ordinary sized man and, therefore, an ear that will ripen later on. The stalk may be too small and the ear too large and too low down ripening too early or it may have too many leaves or too little foliage, etc., therefore, the seed corn should be selected with reference to a stalk such as we desire in which the energy has been devoted to produce the object we desire to accomplish, namely, a perfect ear with a medium long shank that will keep the ear in the right position. A stalk that holds the ear to the right height, and will ripen medium early and strong enough to withstand storms such as are usual in the vicinity in which it is grown. The ears must be thoroughly ripened on the stalk after which the stalk can be cut and placed in such a position as to keep perfectly dry or the ears may be taken off the stalk and dried.

The Ear.

In selecting seed corn, all the ears should be of the same type, maturing about the same time to insure thorough pollination. The very early or very late stalks are usually barren for want of pollination, and if pollinized, produces grains of different sizes and shapes which makes it impossible for a planter to plant them evenly. A perfect ear of corn should be full and strong in the middle portion indicating a strong constitution. It should retain its size to near the tip and be well-rounded and filled with kernels. The kernels should lean over the cob at the butt end. The rows of kernels should be straight and uniform in size merely wide enough to admit air to facilitate drying. The ear should be 10-12 inches long, $7\frac{1}{2}$ -9 inches in circumference, contain 16-24 rows of grains, shell 88 per cent. corn to the ear and, if the corn is yellow, the cob must be red, if white, the cob must be white.

The Kernel.

The shape of the kernel will vary with the variety, but in general it should be wedge shaped, because this shape gives space for the greatest possible amount of corn to the cob. It must be full and strong at the tip giving room for a large germ which is essential to strong vitality and high feeding value. The edges of the kernel should be nearly straight but sufficiently convergent to allow the rows to fit closely together and should be 5-16 of an inch in width, $\frac{5}{8}$ of an inch long and about $\frac{1}{8}$ of an inch in thickness.

Preservation of Seed Corn.

Much seed corn is injured by improper methods of drying and storing, especially during the first month or six weeks after husking, at which time it contains 25 per cent. or more of moisture in the kernel and cob. It should, therefore, be hung up or placed on racks made of narrow strips with spaces between for air to pass in, a dry and well ventilated place. If this is not done its vitality is almost sure to be injured by moulding, fermenting, germinating or freezing. Seed corn should always be stored in the ear and never be kept in boxes, barrels or sacks. Natural drying, if there is time, is always safest. After this selection is made during the winter or at least six weeks before planting, a final selection should be made. This can best be done by selecting a single ear representing the type wanted with regard to shape of ear and character of ear and character of kernel. With this ear in hand, compare all the rest and select a sufficient number of ears most closely representative of the type desired.

Testing the Germinating Vitality of Each Ear.

Many a field of corn on account of imperfect germination has to be replanted or is patched up by planting odd hills, which is usually labor thrown away, there being insufficient pollen to properly fertilize the late silks, or a poor stand is allowed to remain and largely reduce the yield per acre; therefore, on a well conducted farm the germinating vitality of every ear intended for planting is tested. This can be done in a number of ways. One of the easiest and one that insures natural conditions can be done by making a box 2, 3 or 4 feet square and 2 or 3 inches deep, fill it with sand or soil and line it in blocks $1\frac{1}{2}$ inches each way and keep moist and at 70 F. Take 6 grains from each ear—one from the butt, middle and near the tip of the ear, turn the ear and take three more grains similarly, place them in square No. 1 and label the ear No. 1; do the same with

another ear and label it ear No. 2, and so on until the box is filled or as many ears as are needed for planting. In four or five days the germination will be complete. Sawdust can be used in the same way. Suppose of the six grains in square No. 1 only four produce sprouts, which means a germination of 66 2-3 per cent., suppose in square No. 2 one of the grains produce only a germ for the stem and another only a germ for the root, which always comes first, or an embryo stem and an embryo root, which virtually means only a germination of 66 2-3 per cent., because a grain that produces only an embryo root can not produce a stalk, and one that produces only a stem, if it makes a stalk at all, will be weak and will produce, if any ear, a nubbin. Suppose grains in square No. 8 all produce both germs, but two of them are small and sickly and have low vitality, which, under the best conditions will produce only a weak plant, which will yield but a nubbin. (Here we are getting on the track of the nubbin-producer.) None of the corn of the above indicated ears should be planted; in fact, only ears having a germination of 94-95 per cent. should be planted. Beginning with such a corn, under normal conditions we have the assurance of a good stand of strong and vigorous plants. After this germinating test 20, 30 or 40 ears which have given the highest per cent. of germination and are good specimens of the type of corn adapted to the soil and climatic conditions, should be selected for a seed corn breeding plot and only corn from one ear should be planted in one row and no other and the row numbered one. The corn of ear No. 2 should be planted in row two and no other; corn of ear No. 3 in row three; the corn of No. 4 in row four, etc., until the breeding plot is as large as may be desired.

Here we have a chance to observe the ears and have a performance record of every one, and in this way eliminate all that will keep down the yield. I have here a nubbin. If that nubbin is produced because of some ancestral weakness, the likelihood is that if it were possible for me under the old system of seed testing or planting or without testing, as most farmers do, to find the brothers of that nubbin, they would be nubbins also. If it were possible under similar conditions to find the brothers of that ear only one-third of which has grains, due to imperfect pollinization, because of the late production of silk, which may be an ancestral weakness, I would find that they too are race suicides. If it were possible to find the ancestors of the barren stalks in our corn field we would then discover a family weakness which gave it a tendency toward that sort of thing. But by the process I have indicated we place ourselves in a position to eliminate all those weaknesses in so far as they are due to seed and heredity. Suppose in row number one produced

by ear No. 1 there are 25 per cent. barren stalks, which is not a high estimate, for as high as 40 per cent. have frequently been found. Will we select seed corn from that row? Not if we know our business. And are we not in position to eliminate the barren stalk? Suppose in row number two we have a large number of nubbins, reducing the percentage in yield maybe one-half. Will we select seed corn from that row? And are we not in a position to eliminate the nubbin in so far as it is due to heredity? We can eliminate the sucker producer, the broken stalk, the stalk with ears too high or too low, the stalk which puts too much vitality into the production of stalk and leaves, the stalks that do not produce the right sort of shank, that ripen too late or too early under the right kind of culture, soil and climate. With all these weaknesses eliminated we should at least double the yield of corn in Pennsylvania, and instead of having 31 bushels per acre we would have 62, or instead of 52,000,000 bushels we should have 100,000,000, which would mean \$25,000,000 for the Pennsylvania farmer—quite an advantage. Corn is as amenable to improvement in quality as to increase in quantity. The grain of corn is composed of six principal parts, namely: First, the tip cap covering the end of the kernel, to protect the germ; second, the hull, which is the thin outer covering of the kernel; third, the horny gluten, or the hard horny part immediately under the hull, and is the richest in protein of any part of the corn kernel, but is not entirely protein; fourth, the hard or horny starch next to the horny gluten, which can be seen to differ both from it and the starch between which it lies, and also contains a large proportion of protein; fifth, the starch occupying the crown of the kernel and usually surrounds the germ, except in high protein corn; sixth, the germ occupying the center of the kernel and ending at the tip and extending toward the crown one-half or two-thirds of the length of the kernel, and contains the embryo stem and the embryo root. The germ contains from 80 to 85 per cent. of all the oil in the kernel and the germ, the horny gluten and horny starch contain 80 per cent. of the gluten found in the grains of corn.

I have here diagrams showing the component parts of a low and a high protein grain of corn. The one has a nutritive ration of about 1-14, and the other of about 1-8, or in other words, one has one part of protein, muscle, blood, bones and milk-producing substance, to 14 of fat and heat-producing substance, while the other has one part protein, muscle, blood, bone and milk-producing substance to only 8 parts of fat and heat-producing substance—a very good fattening ration. Why is this difference in the component parts of the grain of corn? Because just as there is a tendency in some

ears to produce barren stalks, nubbins, suckers and many other defects, as well as in others to produce perfect ears, so there is a tendency to change the chemical composition of the grain of corn, and corn breeders throughout the West are taking advantage of this and are producing varieties of corn adapted for the purpose it is intended to serve.

Immense quantities of corn are used in the manufacture of glucose, whiskey and starch in the West. Corn that is intended for making whiskey, glucose and starch should contain a large amount of starch, because it is the only part of the grain of corn that can be converted into whiskey and glucose. These whiskey and glucose manufacturers have developed a corn rich in starch and oil, because one pound of oil is worth as much as five pounds of starch, and one of the large glucose manufacturers of Illinois, which consumes 50,000,000 bushels of corn annually, pays five cents per bushel more for a high oil corn than a low, which means \$2,500,000 for the farmers, who produce this kind of corn. If the whiskey and glucose manufacturers can produce a corn adapted for their business why cannot the farmer? The farmer wants a corn rich in muscle, blood and bone, and the dairyman in milk-producing substance, or a corn rich in protein. In the State of Illinois, beginning in 1896 with a corn that had a nutritive ration of about 1-14, and by taking advantage of hereditary tendency of which I have already spoken, the Illinois Corn Breeders' Association, in connection with the Agricultural Experimental Station at Urbana, and under the direction of Prof. Cyril V. Hopkins and his associates, have developed a corn that has a nutritive ration of about 1-7½, and within the last year have narrowed it still more. This work was on exhibition in the Illinois agricultural exhibit at St. Louis, beginning with less than 8 per cent. of protein in 1896 and increasing to more than 14 per cent. in 1903. As I have already stated, the horny protein, the horny starch and the germ contain 80 per cent. of the gluten in a grain of corn; therefore, if we select corn which has a tendency to increase these components we can increase the protein. In the diagram to which I have already referred we see that in the high protein kernel the horny starch extends to the germ, whereas in the low protein kernel there is a layer of starch between it and the germ. It will be noticed on the analytical chart that the increase in protein in high protein corn over low protein corn is almost entirely in the horny part of the kernel. There is a slight increase in the germ also; therefore, if we increase these components we increase the protein. No chemical analysis is necessary to determine the amount of these components. The only instrument required is the farmer's pocket knife. Cut the kernel in two through the middle parallel with

the flat side and you will readily see whether the horny part touches the germ or if there is any white starch between it and the horny part. If only a small quantity, you have a corn that has a tendency toward increasing the protein. Cut the grain again, beginning with the tip end, and shave it down gradually, observing carefully as you go along and you will see whether the starch layer remains along toward increasing the protein. Cut the grain again, beginning with the germ throughout the entire length of the kernel and you will see how the protein increases as you go along. A chemical analysis of your specially selected seed corn will be of great service because you will know definitely what you have accomplished every year. The farmers have in their hands the key to the situation. They raise the kind of corn stalks they desire, the character of ear that will insure a high percentage of corn to the ear, the kind of kernel that will contain the kind of animal food needed. They can eliminate the barren stalk, the nubbin producer, the sucker producer, the ears that come too early or too late, or they can produce a corn adapted to climate, soil and the purpose it is intended to serve.

A Member: Professor, what kind of ripeness do you want to have when you take off your seed corn?

PROF. MENGES: I want to have it perfectly ripe.

MR. HOOVER: Professor, isn't it very essential that we have the corn fully matured in the field, and actually pick out the very best ears and mark them and select them for seed, and having done so, put them away in such a place where the temperature is uniform, out of the reach of rats or mice, and have them in the best possible condition in the spring, and in doing that, aren't you more likely to have the very best seed corn you can get?

PROF. MENGES: Yes, there is no doubt about that, and after you have made that selection, you want to go a little further. You want to select about twenty or thirty or forty ears of the very best corn that you have, and of those that are most similar to the corn that you want—those you want to plant in your breeding plat, and you don't want to plant any two ears in one row.

A Member: Side by side, Professor?

PROF. MENGES: Side by side, yes.

MR. WAYCHOFF: Professor, you have been holding up before all these people this afternoon a white ear of corn. I regret somewhat that that is true, but I want you to take this ear of corn (handing Prof. Menges an ear of yellow corn) and compare it with your ear of white corn, and tell us which is the best.

Prof. Menges took the two ears of corn, placed them together, and turned the butts toward the audience, with the remark that he would allow them to judge for themselves.

A Member: Professor, how close in the row would you plant that corn?

PROF. MENGES: Three and a half feet apart each way. That depends on the soil. If I have a good limestone soil, I might probably put three stalks to the hill.

A Member: Do you shell it all at the small end?

PROF. MENGES: No, I do not.

PROF. SURFACE: Professor, would you just break those two ears across, so that we may see how they compare? Let us see the cross sections.

PROF. MENGES: I would like to weigh these two ears of corn and shell them, and then you would get down to something definite.

A Member: Which has the most feed value?

PROF. MENGES: I haven't got to that point yet; I will take that up later, in its order.

MR. WAYCHOFF: In presenting those two ears of corn to this audience, to judge which is the best corn, you have only given them an opportunity to judge on one point and that was simply as to the butt end of the ears. Now is that a fair impression to leave with this audience, by giving them only an opportunity to judge from that one point?

PROF. MENGES: I did not judge it at all; I left it to the audience. In my estimation, that one point would gain my opinion.

The meeting adjourned to 7.30 P. M.

7.30 P. M., Thursday, May 25, 1905.

The meeting was called to order, with P. S. Fenstemaker, of Allentown, Pa., in the Chair.

The committee on fruit and vegetables presented the following report:

We, the undersigned committee appointed by the Secretary of Agriculture, Hon. N. B. Critchfield, to examine the fruit, vegetable and grain exhibit at the spring meeting of the State Board of Agriculture at West Chester, Pa., May 23 to 26, 1905, desire to submit the following report:

The apples exhibited were a plate of Stayman Wine Sap, grown by Dr. J. H. Funk, of Boyertown; Decker Seedling, grown by Henry W. Northup, of Glenburn; Langdorf Seedling and Gibbs, grown by J. B. Johnston, of New Wilmington. The apples were exceptionally fine and well preserved without cold storage. The quality of the Stayman Wine Sap is recognized as one of the leading apples in quality and is wonderfully adapted for Eastern Pennsylvania. The Decker Seedling is especially recommended as a promising new variety.

The corn that deserves special mention among the yellow varieties is, the Colossal, Hildreth Yellow, Dent and Riley Favorite, and among the white varieties, Boone County White, U. S. P. B. Selection No. 119 and Iowa Silver Mine.

Respectfully submitted,

J. H. FUNK,
J. H. LEDY,
Committee.

The CHAIRMAN: Is there any action to be taken on this report?

On motion, the report was adopted as read.

The CHAIRMAN: Before taking up the regular program, there is some time to answer questions on the papers of Mr. Schwarz, Prof. Watts and Prof. Menges. If any of the members desire to ask any questions in reference to any of these talks, if they will hand them up now, they will be answered.

DR. FUNK: Mr. Chairman, there have been a few questions handed in that were not handed in last evening, and there was no opportunity afforded during the day to answer them.

QUESTION: Is there any danger of the San José Scale attacking the forest trees?"

DR. FUNK: Well, I think beyond doubt there are certain varieties that will be attacked by the San José Scale. They seem to have a preference for certain varieties of trees, but then in case of their not having the opportunity of feeding upon those, there is special danger it seems to me that they may attack others.

QUESTION: "Why not make up a stock solution of the lime, salt and sulphur wash. You surely want it to last for several days or weeks on the trees?"

DR. FUNK: The reason we cannot do that is this: For instance, you make up to-day a lot of the solution and you want to use it to-morrow. The acid principle of the hydro-sulphate is thrown down in the form of a sulphur-like crystal and it is not efficient unless it

is again reboiled, and it will take at least two hours before you can again reboil as required and get them into an acid form, so it is always advisable not to prepare more of it than you can use at once.

QUESTION: "Has Dr. Funk or any one in the audience any experience in spraying potatoes to prevent early and late blight? If so, what has been the result?"

DR. FUNK: I have had a good many years' experience in spraying for the blight, and with very satisfactory result. In fact, I have never had a potato fail that has been thoroughly sprayed that has been affected by blight, either early or late. You can depend upon it that by using the Bordeaux Mixture No. 1 or the arsenite spraying, if you commence in time, to effectually prevent it. I commence spraying mine just as soon as you can see them; if you wish to prevent the blight, that is the time you must commence, before the spores are established on the plants.

MR. THURSTON: I would like to inquire if you have ever sprayed for the oyster shell bark louse?

DR. FUNK: I have never sprayed for the oyster shell bark louse with the lime, sulphur and salt, but I have sprayed for the San José Scale and I would consider the one just as hard to destroy as the other.

MR. JOHNSTON: Will Dr. Funk tell us what power he uses on his sprayer to give a uniform pressure of 120 pounds to the square inch?

DR. FUNK: I use a little gas apparatus; it is carbonic acid gas put into tubes, holding fifty pounds of the liquid. It is put in under a pressure of 1,800 to 2,000 pounds to the inch which condenses it into a liquid.

MR. SCHWARZ: Where do you obtain your power?

DR. FUNK: We own the tubes and send those tubes to Philadelphia to the Carbon-dioxide Company to be charged.

A Member: What is the size of the tube?

DR. FUNK: A 50 pound tube.

MR. BRINTON: How soon after planting should an apple orchard be sprayed?

DR. FUNK: I claim that all trees should be sprayed with lime, sulphur and salt. It will keep off all lichens, as I had illustrated this spring quite distinctly, in spraying some thirty acres in the spring of the year with lime, sulphur and salt. We cannot entirely rely upon the Bordeaux mixture.

Questions relating to poultry answered by Mr. Orr.

A Member: How do the Orpingtons compare with the Plymouth Rocks?

MR. ORR: They are from half a pound to a pound larger than the Plymouth Rocks and they develop quicker either into broilers or roasters or egg producers. As to egg production they are about the same, as to size or number of eggs; as to total qualities, I have always esteemed the Wyandottes better than the Plymouth Rocks, and the Orpingtons are better than the Wyandottes. I spoke to you this afternoon in reference to the quality of the fibre and flavor of the flesh; as to broodiness, they are about the same.

MR. SEEDS: How do the white leghorns compare with the Plymouth Rocks?

MR. ORR: The white leghorn hen is the queen of New York for egg production, first, because they lay a white egg, and second because of their superior table qualities; the New York people are learning how to supply just what they want.

The CHAIRMAN: We shall now have the pleasure of listening to a lecture, which will be illustrated, on "The Horse," by Dr. Leonard Pearson, State Veterinarian, of Harrisburg, Pa.

(Note.—The lecture of Dr. Pearson consisted almost wholly in the exhibition of pictures thrown upon the screen, hence it is difficult to present even a synopsis of the address without the pictures.)

At the conclusion of Dr. Pearson's lecture, the next number on the program was taken up and the audience had the pleasure of listening to an illustrated lecture on "Birds and Insects," by Prof. H. A. Surface, Economic Zoologist, Harrisburg, Pa.

The following is a synopsis of the address:

BIRDS AND INSECTS.

BY H. A. SURFACE, *Economic Zoologist, and Professor of Zoology in the Pennsylvania State College*

(This address was illustrated by a beautiful series of slides kindly loaned for the occasion by Messrs. Williams, Brown and Earle, of Philadelphia, and by others made by Prof. Surface and colored from life by Mrs. H. A. Surface. The address was given extemporaneously and with the characteristic enthusiasm of the speaker. The audience was intensely interested from beginning to end, and many questions

were asked during the course of the address without materially interrupting the train of thought which was presented.)

The speaker illustrated representatives of all of our families of native birds, beginning with the aquatic or lower forms and ending with the thrushes. He spoke of their haunts and habits, and especially of the food, with particular reference to the kinds of insects which birds eat. He showed that while the wading birds live in damp places, and the plovers and killdeer in grassy pastures, eating the cutworms and other injurious insects that may occur in such regions, the Quail feeds mostly on the ground in dry regions, and the Meadow Lark feeds in open pastures and near the haunts of man, especially eating grasshoppers. The Quail is a valuable bird, both as a destroyer of weed seeds and as an enemy of such injurious insects as the potato beetle. All farmers would be justified in protecting this bird on account of its great economic value. It should be furnished partial shelter and food during the time the snow is on the ground.

The speaker mentioned the fact that the Ruffed Grouse, also called Pheasant, endures our winters for the reason that it roosts in trees, and feeds on buds. Thus it is not often smothered with snow, and its food is available at all times during winter. He showed that different birds have different realms or regions in which to feed, as the Swallows skim over the waters and over grass and grain fields, taking insects as their food while flying, the Chimney Swifts fly higher and feed on the winged insects of the upper atmosphere, and the Night Hawks and Whip-poor-wills fly and feed at night when the larger insects are moving.

The Flickers, Catbirds, Robins and the Wrens live near the abode of man, and feed upon the insects of orchard, field and garden, while the Woodpeckers are constantly to be seen gathering grubs from the larger branches of trees and destroying codling moth and other serious pests. The Nuthatches and Creepers are searching beneath the bark of trees for pests there concealed, and the Chickadees and Kinglets are making a most careful search for pests on the smaller twigs of fruit and other trees. The Warblers are constantly busy in the tree tops, going even to the tops of the highest trees searching for the insects that there may be found. There is no place where pests occur that does not have some of these feathered friends making their home and exerting all their energies to take as food the insects that are most injurious to mankind.

The speaker then mentioned several obnoxious insects and the different kinds of birds that he and other investigators had found destroying them. Pictures of these insects and birds were shown and similarities and differences were indicated.

While there are many injurious insects that are eaten by birds, it is well known that there are many insects that are decidedly beneficial to mankind, and the question may well be asked if these insects are not also destroyed by the feathered songsters. The speaker took up this point in a very attractive manner showing pictures of beneficial insects and pointing out the fact that there are very few birds or reptiles that have ever been known to destroy these friends of the farmer and fruit grower. Among such friends he enumerated the Lady Beetles, the Lace-wing Flies, the Syrphus Flies, which feed on plant lice, the Ground Beetles, which are exceedingly numerous, but are not often eaten even by ground-haunting birds, the Honey Bees which are so valuable in fertilizing flowers, and the Bumble Bees which are essential for the production of seed of red clover. The Scavenger Beetles are also important beneficial insects, as are the Burying Beetles, the ferocious Tiger Beetles, the predaceous True Bugs, and the egg parasites or Chalcids. All are important in aiding to hold in check others of their general class. However, it is very remarkable that by the most careful observation, birds have very rarely been seen to eat any of these beneficial insects, and very few of the latter indeed have been found in the stomachs of birds that have been examined by naturalists. The audience was advised to study Nature carefully and learn to recognize and protect their friends as well as to detect and destroy their foes, and to learn the plan of Him who "doeth all things well."

The speaker was enthusiastically applauded and given many congratulations at the close of this evening's entertainment, which was one of the best that had ever been enjoyed by farmers' institute workers.

Adjourned until to-morrow morning at 9 o'clock.

Memorial Hall, West Chester, Pa.,
Friday, 9 A. M., May 26, 1905.

The meeting was called to order by C. B. Hege, Chairman, of Marion, Franklin county.

The CHAIRMAN: We shall now have the pleasure of listening to a song by Mr. H. H. Hall, of Potter county.

Mr. Hall then sang a song entitled "Dodging Our Way Through the World." (Applause.)

MR. LOCKWOOD: I would like to ask Prof. Menges if he has ever read a book—I have no doubt he has, as it is public document—

relating to corn. This public document any of you are entitled to. Send to your member of Congress and if he don't get it, ask an appropriation for it, and print a million copies, and set the presses to work. The title of it is, "Argument on the Revised Patent Laws; Senate Miscellaneous Document No. 50, Second Series, 1878."

MR. HALL: (Handing a grain of corn to Prof. Menges.) Professor, I would like to inquire whether the grain of corn handed you is a protein grain of corn.

The Professor explained that to determine this accurately, a chemical analysis would be necessary.

A Member: I have ascertained by chemical analysis that some corn raised from the same seed under different conditions, varies in a chemical test as high as one per cent. in different crops with the same seed.

PROF. MENGES: On the same soil?

A Member: Not exactly, but the relative crop is about the same; about ninety bushels in each case per acre.

PROF. MENGES: When I started out yesterday, I said that you should select a variety of corn from the corn that has been produced in your soil and your climate, and that is a great consideration; the soil and climate certainly have a great deal to do with it. Now if you have a corn that is grown in your soil and your climate, and there are ears on that corn that have increased the amount of protein that corn has adapted itself to those conditions, and then the hereditary tendency is adopted and consequently you can expect from that corn, in all probability, an increase of the protein.

I won't say that this is so. These things are in an elementary stage of development, and it will not do for a man to get up here and make positive assertions. If you have a high protein corn over in Illinois, and bring that over into Pennsylvania, expecting that it will produce the same thing here, you may be disappointed. No one can say positively that it will produce high protein corn in Pennsylvania, and why not? Why, because you have changed the conditions entirely.

MR. TEMPLE: We have here with us Mr. Henry Forsythe, one of our neighbors, who was glad to have had the privilege of opening this session. We should be glad if the chairman could grant to him a few moments.

MR. FORSYTHE: Mr. Chairman, I haven't anything very special to say in this matter except that I have been following the selec-

tion and breeding of corn to some extent for twenty years. I feel that not only is corn influenced by a particular soil, but in this section, our soil changes with a difference of only a few miles. In this particular case, which I raised the question about, it was the same corn subject to the same selection, and it had been about ten years on that soil, and in the other case about five years on the other soil. Originally it was the same, selected by the same party, and under the same relative conditions, and a crop almost the same, consequently it seemed to me the climatic condition had no weight in this particular case. Wouldn't that be so?

PROF. MENGES: I am not prepared to say yes or no. I suppose that there are conditions such as you have described that cannot be attributed to anything definite because we don't know anything definite.

MR. FORSYTHE: I thought it might be interesting in this case, because it was rather a hard proposition for me.

PROF. MENGES: I want to say further that when this general tendency which is in that ear of corn has been taken advantage of, the chances are always in favor of increasing that tendency, and it has been done in the State of Illinois, as I said, from a nutritive ration of one to fourteen or sixteen to one to eight, and in the last year they have narrowed that nutritive ration down from one to six in many instances; I had a letter from Prof. Hopkins in which that statement was made. According to the corn described by Mr. Forsythe, may I ask you whether you had that corn analyzed?

MR. FORSYTHE: I did; it was analyzed.

PROF. MENGES: Did you select an ear that had a tendency to produce an increase of protein?

MR. FORSYTHE: They were simply selected for a certain type of ear, but they were selected under the same conditions and by the same party in both cases.

PROF. MENGES: There are (exhibiting) two ears of corn of the same type; that one is developed for quantity, this one not so much so; that is more of the real type of the ear of corn that we have, and the protein in that ear of corn is a good bit larger than this in the same kind. You don't know whether you had ears that had a tendency to increase the protein or decrease it, did you?

MR. FORSYTHE: No, I couldn't say as to that.

PROF. MENGES: You didn't have that in view in the selection of the seed corn; examine that grain and then you will be able to determine.

The CHAIRMAN: We learned yesterday that the product of corn per acre in Pennsylvania was twenty-nine bushels, was it not?

PROF. MENGES: In 1903 it was thirty-one bushels.

The CHAIRMAN: Now why is this? I know people in Pennsylvania that don't think anything about raising less than a hundred bushels of corn per acre. Now is it in the seed selection, or is it because the land has lost its fertility that the average is so cut down? I believe that every acre of corn, even in a dry season, can be brought to average from eighty to a hundred bushels. I believe that I have ground prepared and planted in corn on my land, that if I get one or two rains, that I can grow a hundred bushels; it is the lack of cultivation in the ground.

MR. HERR: I think the gentleman must be talking about corn ears and not shelled corn; very few people ever grow a hundred bushels of shelled corn to the acre.

The CHAIRMAN: We will now have the first number on the program, which is an illustrated "Chalk Talk on the Dairy Cow," by J. D. Detrich, of West Chester, Pa.

Mr. Detrich spoke as follows:

CHALK TALK ON THE DAIRY COW.

BY J. D. DETRICH, *West Chester, Pa.*

Mr. Chairman: The whole human race have always been very much interested in the subject of production and reproduction, and if we were to characterize this age of agriculture, we would call this the age of breeding or of heredity. Whether it is the President of the United States, or whether it is any citizen who has passed away and done some noble service for his country, we are always ready to write up his biography. We to-day are so thoroughly convinced of the importance of selection for the purpose of advancing the interests of agriculture as well as breeding live-stock, that we have taken a very deep interest in the selection of those animals that will do the best and produce the best, and be of the most beautiful; and it is also a subject of important consideration to determine the profit to be derived from the pursuit of business along these lines. These things

have been fundamental interests from the time of Plato. They have found their way to us through the universal human heart and mind and will continue to interest us for all time to come, whether we breed cattle, fowls, horses or plants, whether we view a landscape decked with beautiful flowers or enjoy the verdure of summer, as we look out over our fields.

The human mind has the power to perpetuate and order the growth of plant life or the conditions which govern animal life. The day will come when the laws of marriage will be much more stringent than they are at the present time, so that we may have fewer hospitals and insane institutions, and all these things which are now provided for the imperfect or diseased members of the human race. What is humanity going to come to unless we regulate the laws of marriage? No person wants to breed a lot of weaklings, and in order to avoid that, you must make the conditions such as to produce the best and those which live the longest.

We must learn to exercise the power of selection, as you have heard in the lectures of yesterday afternoon and evening, and likewise this morning. It is necessary even for the purpose of growing plants and corn crops, and as you have learned, it is a fact that we are commencing to breed corn, a thing that was not known of a few years ago; and when one turns his eye back to California and sees the work that Burbank has done with the wild cactus, for it is said that he has turned that into a fruit to-day, not only for man but for animals. It is wonderful what the human mind can do when it simply sits quietly down and takes up the laws of God, and studies them and follows out their teachings.

The work which Burbank has done is remarkable in every respect, and it seems that when we are down to the lower forms of life, we can handle them best, but that don't argue that we can't handle the higher forms. We will continue to go higher in our knowledge of all the laws of God. We will not stop simply with the plants that Burbank is handling, but we will push on; we are commencing to handle the animals to-day.

This subject appeals practically to me as a dairyman; it would be impossible for a man to succeed in the dairy business unless careful in the selection of his animals. You will never be able to attain to any real growth or progress without cultivating and developing your knowledge and your eye most carefully along the lines of improvement in the selection of animals, and then comes the question of care and feeding. I am not surprised that people quit breeding cattle; not at all. Could you take a soil deficient in potash and nitrogen and grow an animal as vigorous as the one that starts on the prairie?

The cattle business is a wonderful business in the West. In those native soils that have never been touched with the plow, just touch them with the plow, and you soon see the cattle range disappear; there are not the elements in the soil to grow the bones desired in these animals. We speak to-day of knowing all these things because they have been tried. When I saw Sexton's big steer, the first time I saw it, I said, "Was this raised on this Montgomery farm?" He said, "You well know you could never start a steer like this on these wornout soils of Pennsylvania;" and he commenced to tell me how the animal was started on a prairie in the West.

These general laws have driven us to study and to investigate more closely into the conditions necessary for success in the dairy business, have taught us to observe the form and the conformation of the animal of which Dr. Pearson spoke last night. They are so necessary. Why? Because we believe that inward qualities are expressed in outward signs. Let a lady go into Wanamaker's store in Philadelphia to buy a garment. She judges by the texture and appearance; looks most carefully at it to find out how it is woven, and the application of her judgment to these points will determine her purchase. It is the same way when you examine a building. You look at the material and the way it is put together, and when it comes to human life and animal life or plant life, you commence the examination, basing it upon the whole fibre, the structure and form, especially the form, to a very great extent; if that is carefully studied it will show you exactly what it is in the one and in the other. We will all admit the laws of physiology; that there is expressed in the countenance and in the form and in the general conformation as well as the line of ancestry back of it, certain tendencies, certain peculiarities which identify themselves with a particular family. You will admit that these things express inner qualities which you can perpetuate and hand down in a uniform way. If you could make a selection of the best of these qualities and hand them down, it would be a great benefit to civilization and to yourselves. At first I knew nothing at all about the laws of breeding. When I found out that I had a valuable animal that produced a fine calf, I considered that I had something to build up to.

I have learned that we must work on this basis; there must be a careful selection of sires, for that is the true line of breeding. You have but one sire, and you must look to your sire for the improvement of your herd. If in some one instance the dam has more influence than the sire, it will be found after all that it will be to your advantage to especially look to the sire. When animals are selected for the race track, it is the sire that brings out the qualities desired, and it is the sire that brings the thousands of dollars which

we read of. It is very seldom the dam is sold for so much as the sire. If the sire has the ability to transmit and goes into a herd, he is able to impress his prepotency and his qualities upon that herd in such a way that the whole herd is built up, and the improvement is commenced then and there. The question sometimes arises, should that sire ever be killed or slaughtered, because he is cross or ill-tempered? Or should he be killed because he is getting old? I say no, that sire should be handed from farm to farm until natural laws take him away.

In dealing with the subject of breeding, one of the most important questions, we always start with a calf that has a good ancestry back of it. Let us take a line of ancestry that we know to be good. The first thing to look at in ancestry is the constitution. While I endorse every word said about inbreeding, I want to say to you that it is one of the most delicate things imaginable in practice. A man should not imagine that he can go into the business of inbreeding because he has paid so much for a sire and so much for a dam. It requires the nicest observation, it requires years of experience for a man to know when to inbreed; I tried it to my own satisfaction, and made a most miserable failure and mistake at it. We have to handle these laws most carefully and knowingly. When we think of what Burbank does, we can see the difficulties surrounding the question. There are hundreds of thousands of plants that he raises, and his great eye goes over that great growth and simply selects out one or two which he bases his work of development along certain lines, and for the purpose of reaching certain results and to accomplish such results, it needs anxious care and observation. As it is with the plant, so it is with the animal; therefore, in order to make it a profitable business, if we want to succeed, we must start with the animal in such a way that we breed the animal right.

We will start with a thoroughbred. If a man wants to improve his herd of cattle, he can do it through the sires. Any person can improve his herd of cattle to-day by bringing in a thoroughbred into the common herd. It is a slower way to do it, but it is a successful way. We can learn along these lines how to accomplish results. Then another thing, we must learn that we must take just as good care of the soil as we do of the animal. While many persons disagree with Prof. Cooke about the fertility of the soil, I would endorse that foundationally. You must have the three elements in your soil. You can fatten plants just as well as you can fatten animals. You can get more protein into your plants if you have it in your soil, and get more phosphoric acid if you have it in your soil, with hay and grain from your soil that is rich in these qualities. You don't know when the rain is going to come; you must have it

there so that if these conditions are favorable, nature will take it up, because there is an abundant supply. I am not talking about the renter and the landlord, but about honorable farming. Where a man is in touch with God's earth, he is responsible to his Heavenly Father, as a steward of his possessions. Farming is taking this earth where God has breathed into it this life and fertility, and if the robber man steals it out and then accuses the Almighty for making the earth so poor, there is no greed more to be pitied than that of a man who so little regards his obligations to his race and so recklessly esteems his relations to the creative work of his Heavenly Father.

When you see the rich fields in the prairies of the West laden with every kind of element to make the plant grow, see the earth in its richness and its fruit, and realize what the hand of the Maker has done, and then look at your own State and see what has been done by the hand of man, you can see very well that it is man's own disposition of taking something and giving nothing, which has brought about the existing conditions, and which you know is the worst kind of business to do, and the method is comparable only to that of those animals that make their living by stealing. The example that you should have is, to take these elements that God has given so richly to the earth for the feeding of the plant and the growing of the animal, and apply them in the wisest and best way according to his wonderful laws.

It is this system that has made Flourtown, that has made it known in the eyes of its friends as well as its enemies. They had to admit it was there. When you went into the dairy room, you saw sleek animals with full udders and health in every face, and could not fail to recognize that every animal was bred for the purposes of the dairy. We discarded all the animals bought for \$25 and \$30 and we took thoroughbreds and commenced to bestow a great deal more labor and care upon them; commenced to examine and select the calves, and in doing this as we learned from the Island of Jersey, the calf was turned over on its back, and carefully examined. We watched the depths of the animal's ribs; observed whether the legs were short; noted the shape of the head, the contact of the upper lip; put our finger between the last rib to see whether there was space there so that the animal could take in fat. We looked at the whole structure of it, to see whether the animal was good enough to keep, or whether it was useful only for chicken food. The more careful we were in selecting these animals, the better returns we got for them. We watched them carefully from the moment a calf was dropped until it went into the dairy.

There are some little things that will come up that will have to be considered and acted upon. It is a question with me whether a calf ought to have a protein feed, as is usually spoken of in our dairy institutes. Take, for instance, the case of children. For the first few years of the existence of a child, it ought to be fat and plump, and in order to produce this condition, you give the child milk and sugar to make it grow. Now what applies to the child will apply to the animal. When you come to the other side of the animal, we try to give it skim milk to grow the bones and muscles, and in addition to the skim milk there are several things we ought to add; we ought to add a little more carbohydrates to the food of a calf. I have noticed in those calves that would take on a good strong shoulder in the first eighteen months of their lives, those animals were the strongest working calves in the dairy herd. I have tried the plan of giving them skim milk and bran to keep the animal in the required condition.

The doctrine taught a few years ago was that a heifer was to have no corn meal at all, and that she was better for not having any ensilage; that clover, hay and bran and linseed was the correct thing in the way of feed. When you keep that skinny outline and keep the bones growing, there is something about carbohydrate feeding that is necessary for the young animal. It seems to come along with a better form, get more vigor, and stronger constitution in feeding that way. Now the very advantage that we got from the feeding of so much protein and so much skim milk, we found made a big difference in the dairy herd. About three or four months from calving you commence to see the shoulder dropping off and commence to take on the dairy form, and shape up for her motherhood, and considerably more vigorous than when brought up on the protein feed. That is our experience in regard to the matter. When we came to develop the udder of these heifers, it was a very nice thing to do. We have had but one sire in all our history at Flourtown that could put an udder upon everything with which he came in contact. We were certainly assured that that animal would bring such a result every time. Now every one of his heifers showed up splendidly as well as in productiveness. There are certain things about the udder that we want to think about. Our doctrine is, no udder, no cow.

Now there are three ideas that must be kept constantly in view in breeding. I believe that a man who takes an animal and breeds an animal up to a state of perfection and beauty, is just as great an artist as Beethoven or Mozart, or any artist that undertakes to take material of clay and model a statue or paint a picture, for he develops it just as carnations have been developed. We are looking at these questions because we know that from like comes like, and

we must learn to follow Nature's laws and work along the lines that experiment has shown will bring the required result. We can see that in the bare form; certain indications that show what an animal is going to be. Suppose we take up the question of that heifer that we turn over on its back. We examine its mouth and eye, note the shape of the neck, the line of its back, the angle of the form along here (indicating on black-board). All these are splendid things, but suppose the animal has a beautiful form, and she has no line of udder, when it is eighteen months old; when you stand on a side view, find you cannot see one of the front teats. It is a pity that such is the fact, for you have made a mistake and it is a pity that you have not bred better. In the dairy animal you must have that conformation in such a way that you can get out of it its best qualities. You know that the milk secretion is there and if there is not room to hold it, you are going to get into trouble about it. If you have an equally developed quarter, and those teats are just the right shape, so that a man can take hold of them and milk them very well and easily without squeezing the glands hard, then you have what you want. Time and again I have read in the dairy papers, something like this: "One of our cows don't give milk out of one of her teats." The officials will say, perhaps, the man has been milking that one teat too hard; he has closed up the inside of that gland by squeezing it too hard. Those are the things that render cows valueless time and again.

(Mr. Detrich made quite a lengthy explanation from a chalk diagram on a large black-board of the conformation which he regarded as best in a dairy cow. He drew a number of lines indicating good and bad conformation, and described in terms that could only be misunderstood by those viewing the diagram, the essential requisites to be sought for in the make-up and bodily organization of a successful dairy cow.)

If a man has a poor cow, it is not the cow's fault; it is the breeder's fault, for we can correct any faults that may exist simply by the laws of selection, just as we correct the corn and breed it for the purpose for which we want it. If we want a food breed, that is one thing; if we want dairy breeds, that is another. Therefore we must conform to the lines which are productive of milk and butter, if we want to succeed in the dairy business, and if we want beef, we must conform to the lines that are necessary for success for that purpose.

Now if we take up the feeding of the animal again, there is no doubt a balanced ration will be of very much advantage in handling our dairy herd, yet what folly to follow that to extremes. It will not do to just say, here is the book and here is the arithmetic. As

far as figures and proofs go, it is very easy to cipher it out, but what does the cow's digestive system say about your arithmetic? There comes a question for you to settle again. A man must be just like an engineer who has his hand on the throttle, that directs the locomotive, when to go and when to stop. There must be no guesswork about it. The dairyman must have that knowledge in order to succeed, and if he has not got that knowledge, he must learn it. He must read the very best books in order to come in contact with it, and beside that, his own personal observation must be continued and constantly directed to enlarging his knowledge, and he must profit by his experience.

There is nothing that has helped the dairy business so much to-day as photography. I have a portfolio in which I have preserved pictures of the great sires and great dams from the time I first took up the handling of a dairy in Flouertown. I wouldn't take anything for that portfolio to-day. By means of it I can compare the great sires and the great dams. It is astonishing to note the uniformity of the lines which they show. Of course there is a difference in them, but you can distinguish their individuality. There is a uniformity of lines in these animals that is something very remarkable. The line of the back should be long and level, like this (indicating by drawing a line on the figure of a cow on the blackboard.) You can see that there is plenty of room for the maternity of the animal. An animal should have an abundance of room in here (indicating). It is the same way with the conformation as we come down to the udder, drawing that line in this form (indicating on blackboard); that is the way that the dairy animal should stand, while the beef animal will turn right out the other way, and then come in and add it on in this way, for the beef animal instead of being cut out for butter in that way, you have the udder just coming right out in this form. This side of the animal starts down slender here, swells a little in this line, and grows up in this angular form; the udder comes swinging around in this form (indicating) and every man will notice when a cow has had her third calf, her udder will just come down just a little bit above her knees and her teats will reach just a little below the knee, coming down in that way (indicating on blackboard).

(Mr. Detrich made quite a lengthy explanation wholly with reference to a diagram of a cow on the blackboard which, because of its character and relation to the diagram, had to be omitted, for the reason that without the diagram, it would not be intelligible.)

The head is just as important in a dairy animal as it is in people. If the animal has not got a good head, you don't want it; and you also want a real good jaw.

(Mr. Detrich traced the lines of head and jaw as he conceived they ought to be.)

Unless we sit down and study the figures of animals along the particular lines that we are dealing with in our breeding, we shall never make any progress because we shall not have the necessary data to work from. We must know what we are after and breed accordingly, and how can we select unless we know what we are after.

In the New Jersey Bulletin—the last issue—you can see the cut of the son of Tudor; I wish every one present could examine that. I never saw as fine a head, as fine fore-shoulders, nor a better fore-arm on an animal in my life. I hope you will look at it carefully. You want a bull to be masculine, but you never want him to be coarse. A bull ought to have a crest that is high; the head of the sire should be high, but yet not coarse. There should be no coarseness about it. The hindquarters of the sire should be exactly like the hindquarters of the dam. The dam throws her hindquarters on the son, and the sire throws his hindquarters on the heifer. This law holds wonderfully well in scientific breeding. These laws hold very much more permanently than we are inclined to believe.

You sit down and cut from the newspapers all the different animals that you see. Take the figures and commence to study them and look at the records which are given with them to-day, and you will see just what constitutes the type and form and that is being done to-day for the science of breeding. I thank you for your attention.

Questions and Answers.

MR. STOUT: I would like to ask whether there is anything like a general purpose cow?

MR. DETRICH: I never met her and I never studied her.

A Member: One point I hope has been impressed upon this audience, referred to by Dr. Detrich, and that was in the selection of the male. That is one of the most important points in breeding cattle particularly. I agree with the Doctor when he said that the sire, through the dam, conveys to his heifers the milk and butter qualities; is that correct?

MR. DETRICH: Yes, that is correct.

A Member: You spoke of the carbohydrate feeding for the calves. Did I understand you to advocate that?

MR. DETRICH: The carbohydrate feeding for the young calf, I think is very much like a child. You know children crave for sugar and they want, and must have it. They are always plump and fat, and all that fat will after a while leave. I have noticed the very same thing in the dairy animal; you know our physical organizations are not so very dissimilar. I find that the young really ought to have more carbohydrates than we are inclined to feed them.

MR. MARTIN: Did you ever have trouble with milk fever?

MR. DETRICH: I never had milk fever but once or twice in all our history in dairying; milk fever comes from improper feeding, or from exposure and improper feeding.

You know the custom at Flouertown was not to let a dairy animal run at large. We take the food to her and give it to her in such a balanced ration that we could get the very best results, therefore, we stabled the animals almost continuously. The only time we let a cow out was when she was dry, and then we made her go out and stirred her around and gave her plenty of exercise.

We are getting more and more to live under roof, and we must make provisions accordingly. I have found out that a dairy cow for 365 days in the year, if she gets the care, the attention and the necessary light, and the necessary support, she will do the work, but you must make that provision for her, and therefore you must watch her at every stage. If she is approaching the time when you expect her to give birth to a calf, if you keep on feeding her as when she was fresh in milk, you will ruin your cow. I don't know when I have sent a man out with a bucket of hot water to sponge a dairy cow; we don't ever bother with that; we watch the cow while she is making her udder, and we always try to make a cow go dry at least four weeks before she becomes fresh, and as soon as she is dry we give her timothy hay and water. We found that was the best in our artificial way of handling the cattle, and what is there to-day that is worth anything that is not artificial? We get the most out of them that is possible when we do our duty to them. We should be very careful to see that the cow is thoroughly dry, so that you cannot get a drop of milk from her. If you leave the least bit of milk in the udder, you are almost sure to have garget or some disease when your cow comes in fresh. We should be sure to have her thoroughly dry. Then we commence to prepare her for maternity. If we think she is putting on fat too fast, we keep her on bran and hay and if we find that she is not making an udder ten days before she should be fresh—we count 285 days for the period—and then we take care of the cow ten days before she is fresh;

we watch her carefully and notice whether she is making an udder. If not, we give her a handful of linseed meal with the bran, and if she does not make an udder in six or eight days, we increase it—give her a little more linseed meal, until we will bring her up to a pint or a pint and a half of linseed meal if necessary, or to even a quart. There must be an udder; we have got to have an udder. Her bowels must be in a good, loose condition; just as long as the cow is fresh we use so much creolin and so much water. We rub the cow off with some brushes and put the calf away in blankets and then give the cow one quart of bran and two or three quarts of cold water several times a day. If you give a cow all the cold water she wants, it will make her bag as hard as a brick, but if you give her cold water as stated, there will not be any trouble; the bag will not get hard. We gradually increase the feed.

MR. ORR: Doctor, do you object to telling us what you mean to do with those fifty-five cows we saw the other day at Mr. Kates' farm?

MR. DETRICH: We have made no calculations on breeding those cattle. They were simply picked up in New York. We will never breed these cattle. I would not be bothered with such cattle, gentlemen. You have got to reduce breeding to a science; you must reduce it to a science as you reduce feeding to a science. You must use it to such an extent as to simplify matters and keep you in the right direction. We should not think of breeding from those cows we have out there now; there is nothing in it; thoroughbreds are not any too good for us.

A Member: Of what value is the milk escutcheon as the means of judging that in the cow?

MR. DETRICH: I think it looks pretty.

MR. LOCKWOOD: What do you consider the best breed for beef?

MR. DETRICH: The Polled Angus is the most rapid and productive.

A Member: I believe that Dr. Detrich can do us yet a whole lot more good by giving us an explanation of the new cure for milk fever.

MR. DETRICH: I think you all know what the treatment is; I have no occasion to use it. The milk fever comes from feeding and not enough exercise; that is what causes it. I would take a cow and put her right down to exercise if I thought there was any danger of milk fever.

MR. CLARK: Are you able to offer any suggestion at all in reference to controlling the sex or calf?

MR. DETRICH: No, we don't know that.

A Member: I would still like to have a further explanation as to the treatment for milk fever.

MR. DETRICH: You can just send on to some of these men in Philadelphia, who furnish the oxygen treatment for milk fever. It is simply a question of oxygen, and it is provided with a rubber tube, a milk tube, and you disinfect these before using them. You put this right into the teat and put this gas into it. Sometimes ones of these treatment's is sufficient for a cow. It is seldom that they need more than one treatment. It is simply a little thing designed to be put here into the udder. One man says that if some of these farmers who are such good blowers will just get a quill and blow the cow full of wind, he will be all right.

The CHAIRMAN: We will now take up No. 2 on the program, entitled "What Shall We Teach?" by J. H. Peachey, of Belleville, Pa.

Mr. Peachey then read his paper as follows:

WHAT SHALL WE TEACH?

BY J. H. PEACHEY, *Belleville, Pa.*

This question is not a new one. It has troubled the mind of man from the fall of Adam until the present day. The truths of to-day have been the doubts of to-morrow. All along the shores of time are the wrecks and ruins of inflated thought and false ideas. The accumulated years are freighted with wrong conclusions. Two forces—the one elevating, consistent and reliable, the other strange, fascinating and ephemeral, have ever contended for the mastery. Frequently the latter, gaining momentary ascendancy, would dominate for a season, but eventually the former, because embodying the underlying principles of fact, would predominate, proving the saying "that truth is mighty and shall prevail."

But the voices of history teach us that the American people cannot at all times wait on the truth. Truth apparently travels too slowly for them. With this strenuous, intensified life it is difficult to abide

the issue, to await the results, to prove all things and hold fast that which is good.

But what shall we teach? Some one says, "Teach what we know." True it is, no one can teach more than he knows. But what does he know? We know that thought must precede action. That before the accomplishment of any enterprise there must be a plan, a purpose, or an ideal. This is called theory. The development of the idea is the practical; the one the counterpart of the other, useless the one, without the other. Why then should either be ignored? Is it good teaching to speak disparagingly of either, or to credit the one at the expense of the other. It is like two men disputing concerning the pronunciation of a word. The first said it is either, the second said it is neither, and the Irishman said, both wrong, it is "nayther."

Good teaching then must necessarily admit both theory and practice. Happy is the man, the student of nature, whose originality of thought and action has created an ideal, and by careful investigation and persistent effort has developed the idea until, as a result of his labors, he gathers forth fruit an hundred fold. Whether this be done in field, farm, orchard or garden the same fond feeling should result therefrom. Such an one is prepared for his calling. Such an one comes before his audience with arms filled with truth, ready to disseminate valuable information, fitted to awaken thought in the minds of others. To teach others how to think by giving them something to think about is one great essential in teaching. Seeing and thinking are after all the great sources of information. In what other manner, or by what other means do we acquire knowledge? Our teaching them must appeal to the eye, the imagination, the mind, in order to be effective. Must inspire others with a desire for a higher purpose in life. Must develop thought for the accomplishment of those aims that make life worth living.

A lady entering a large department store was approached by the floorwalker, whose bended extremities resembled a parenthesis. The lady inquiring for certain goods, was requested by the employe, "To walk this way." Misunderstanding the request, she replied, "I won't if you kill me." And thus we can not all walk alike. Neither can we teach alike. We can not do successful work by being imitators. Each must teach what he is qualified to teach, by putting his individuality into the work, by being himself. This, like beauty, is applicable to all. It affords opportunity for the experimenter to recount his successes or to enlarge on his failures. For the practical farmer to unbutton his eloquence in expatiating upon the manner in which that old desert of a farm, so poor and so dead, that the thunder's diapason long since ceased to produce a sound thereon, now teems with life, and energy, and bacteria, and in-

creased crops, some forty, some sixty, some an hundred fold; for the dairyman to pay tribute to his favorite breed, establish iron-clad rules for feeding, and in story and song tell how to quiet the suspicions of the nervous cow; for the orchardist to sing the bass solo, "Spraying made easy," illustrating the relations existing between the Ben Davis, the turnip and the native apple, also extolling the good qualities of the York Imperial and Keiffer; for the market gardener to grow eloquent on quality and quantity, both being products of brains, water and sunshine; for the scientific fellow whose advanced thought and efficient service is too frequently the subject of ridicule and misrepresentation, to prove that the truths of the laboratory pertaining to agriculture are but interpretation of nature. The true investigator along these lines to-day is the farmer's best friend. And yet there are limitations to his investigations. There are points beyond which he cannot go, problems only partially solved; things that he dare not say because the statements have not been verified, although he believes them to be true.

It is a lamentable fact also that the spirit of cannibalism has grasped an ideal product of a scientific mind, as well as by advertising and the pockets of farmers. What they will secure in return for the investment can only be conjectured. Whether the increased size of the nodules on the clover plant will have "value received" stamped thereon will no doubt appear in the forthcoming testimonials. If soil inoculation meets the claims made by some writers and correspondents, our teaching will necessarily be more limited and a number of subjects can be eliminated from the bulletin.

An Englishman and an Irishman were employed by the captain of a vessel. The Englishman was hired without recommendations, but the Irishman was required to furnish satisfactory evidence of character and workmanship. The first job was scrubbing the deck. The Englishman was pulling the water with rope and bucket, the Irishman following with the mop. The vessel giving an unexpected lurch the Englishman went overboard, and the Irishman was delighted. He went straightway to the captain and says: "Captain, the other day you hired an Englishman without recommendation, but me you compelled to furnish papers. Do you know what that fellow has done?" "No, Pat, I don't know." "Well, he's gone off wid your buckit."

Thus it seems that there is danger in placing too much confidence in men, as well as in that which they represent. The disposition to believe in slight evidence, or take things for granted, frequently results in loss. Recommendations and testimonials may bear false witness or deviate just enough to betray confidence. In the matter of soil improvement the good old way our fathers trod has been

productive of good results. It is yet preferable to the "get rich quick" idea so indiscriminately advertised. Manure, legumes, lime when needed, fertilizers intelligently used, will help create in the soil the new life needed to produce crops for the present, allowing the scientist opportunity to develop more the principle of nitro-culture. We can afford to wait just a little longer; apparently no danger of famine in the land.

Another principle in successful teaching, is to teach what to do, and how to do it, rather than what not to do. A mother on leaving home told her children, "Now when I am away don't put beans in your noses." And the first thing the children did was to put beans in their noses. Had the mother failed to mention the matter the children would not have thought of it.

I remember clearly the "donts" one of my teachers employed; almost one for every minute in the day. Some of them were new wrinkles to us and naturally and good naturedly we wished to experiment with them. These experiments invariably caused trouble.

The surest way is to teach the rule, the principle, the means to be employed. Every rule, however, has exceptions. Whenever the exceptions become more general than the rule, then the exceptions become the rule. This direct teaching also economizes time. It is also more logical and more easily remembered.

Appealing more directly to our question, there are three things worthy of particular mention. They are essential factors in the problem and always applicable. The home, the school and the soil should first be considered. I mention them in the order of their importance, believing that these three, including their proper limitations, complete the list of subjects. They are so closely allied that, like the hues of the rainbow, one can not be removed without destroying the symmetry of the whole.

Concerning the home, it should mean more than a place to stay. If it does not mean more than that, some of the qualities of mind and heart that make life worth living are yet in an uncultivated state. If the country store, the grocery, the village, the street has more attractions for the young than has the home, then either the home-maker or the home-keeper, or both, have not fully realized the value of a life. If the home has not instilled into the youthful mind that kindly remembrance, that grows larger as the years accumulate, and lives in the thought of it being the dearest and best spot on earth, then it has not reached the higher and highest principle of home life.

Wealth alone cannot acquire it. It will assist in making the comforts and conveniences. Beautiful structure, fine location, attractive surroundings, will not alone bring the results. Something

more is needed to build a good home. No home, that is not a happy one, is a good one.

I knew a little boy in school, coming from well-to-do-people. It was cruel winter. The little fellow was poorly clad. While he stood shivering at the stove, his teacher asked why his father did not buy him better clothing. The little fellow said, "Papa needs the money to put in bank." Sometimes the real comforts of life are neglected. Too frequently we do not do as well as we know. Practice becomes easy because of habit. Occasionally we forget.

It is our duty then to assist in making better homes. To secure more of the modern conveniences and comforts; to look carefully after the health of the farmer's family. Much is said concerning the labor problem. We must adapt ourselves to the circumstances and condition. Better houses, equipped with more of the modern conveniences will, in part, solve the labor problem, because it will lighten labor and shorten hours. When this is done part of the difficulty in securing help will be removed. Part of the so-called drudgery will be displaced by more systematic work, the result of higher thinking. Thought must come to the rescue here as in all things else. So much has been said concerning the school that perhaps nothing new can be offered. In some respects we have been progressing; in others we have not kept up with the procession. Many disinterested persons still regulate the affairs of the school; as a rule they represent their constituents. In most instances the officers are very much like the people who elect them. Some school officers remind me of the Egyptian mummies, whose bodies are in the present—their souls are in the past. Our manner of selecting teachers has changed but little. We still employ young men and young women, who remain with us until qualified to teach, then genius goes where the money flows and we employ another. Our schools make experiment stations for town and city; preparing teachers rather than educating the children. Can we, interested in rural life as we should be, afford it? Can we expect good results from such a system? How long shall it continue? Who shall work a change? All along the line there are individuals pleading for better educational advantages. In some localities their influence apparently is unfelt, while in others the colleges and academies have left an impress upon the people that is quite perceptible. It is a noticeable feature of their institutes. This is encouraging. It is satisfactory and conclusive evidence that education, adapted to the needs of rural people, is highly essential for the continuing development of agriculture.

To this end the farmer must evidently assume the responsibility of leadership. No one else is particularly interested. He must

insist upon such changes in education as will better prepare the present and future generation for their life work. In this respect he dare not be entirely limited by the practical alone. The ultimate end of education is a trained mind.

The ideal in education is to learn to do things right. 'Tis said that when Princeton and West Point were lined up for the great game of football, the referee said, "Princeton are you ready?" The answer came, "Yep." "West Point are you ready?" "We are ready, sir," came the complete answer. West Point had learned to do things right. Fact is, the military and naval cadet is only allowed to do things right. He cannot evade it. He must live near the ideal. This principle in education was fully exemplified in the Spanish-American war. "The man behind the gun" had learned to do things right.

This principle can be applied in the home, the school and upon the soil. What a wonderful effect it can produce in all three. Nothing is so expensive as something poorly done. This is applicable to every business or industry. Nowhere does it have a more visible effect than upon the soil. And yet, when properly and intelligently treated there is practically no limit to its productivity. This has been clearly demonstrated in many instances and in various ways. And wherever nature's ways were allowed to regulate the course, the results have been better and more lasting. Wherever nature's laws have been violated the ultimate results have proved disastrous. In teaching then, study and follow nature along all the various lines of farm operations, applying the best methods of successful practice, in connection with the best scientific instruction obtainable.

It has been said that there are but three sources of wealth, brains, muscle and raw material. These three are dependent upon each other. If virgin soil is raw material, and the records are entirely trustworthy, then it has required less brains and muscle to extract wealth from the soil in the past than at present. It is also stated that the soil no more responds to the action of the farmer as it once did—that some of the crops grown in the past can no more be grown successfully in some localities. If this be true then some one has not been treating the raw material intelligently. Brains has not directed muscle in the right manner. Nature has said "Thus far shalt thou go and no further." Here then is the turning point.

Therefore we teach of the home, the school and the soil. Without good homes, the school can not be supplied with good children, or good teachers, and the brains required to work intelligently and successfully with that intricate and poorly understood matter, the soil, will not be sufficiently developed to meet the demands of the

age in which we live. The future farmer should be better than his father. If not, both are failures. The one is a failure because he has not instilled into that youthful mind the thoughts and principles for which he has lived. The other is a failure because he has not embraced the opportunity of enlarging upon the possibilities of the future.

'Tis ours to dignify and elevate our calling by carefully guarding and protecting our interests, rather than allow disinterested parties to direct our affairs, remembering that the hope of agriculture lies in the home and the school.

The following paper, as per program, was presented by Prof. Watson:

FEEDING SWINE.

BY PROF. G. C. WATSON, *State College, Pa.*

Swine have been known to exist, both in Europe and in Africa, since very early times. Some bits of early history mention swine, but do not give any clue as to origin or history of domestication. While a species of wild hog is found in this country, yet it is not thought that the domestic swine came from this species. Naturalists and others hold that the wild swine have descended from the wild hogs of Europe and Asia. The mingling of the blood of these two species, which represent distinct types, have produced the various breeds of improved domestic swine of to-day. Marked changes have been made in producing the domesticated swine of to-day from their wild progenitors. Man is responsible for the great change that has been wrought in transforming the narrow-bodied, long-legged, swift-footed animal of the forest to the compact-bodied, quiet, peaceful animal of domestication. He has created an organization whose energies are expended in an entirely different direction from those of the wild stock. In nature, the energies of the swine were largely, if not wholly, expended in seeking food for sustenance and in propagating the species. In domestication, man, through a liberal provider of food, has been able to divert the energies, as expended in the wild hog, to the production of the most desired food products for his use. The improved breeds of swine of to-day are no longer required to seek food for the preservation of life. The expression "root hog or die" has been entirely obliterated from the pages of the guide-book used for economic

meat production. Man provides that which the wild animal perforce must seek for itself. In making this provision, the nature of the organization has been completely changed, not only with reference to the production of flesh, but also as to breeding qualities. Domestic swine bring forth young more abundantly than do the wild species from which they have descended. They not only breed with greater frequency, but bring forth larger numbers at one time. The wild hog gives birth to few at a time and protects them until they are one or two years of age, while the domesticated swine may produce two or three litters in one year.

In directing the energies of the organization more largely toward the production of those products which man most desires, the organization has also been changed as regards the amount of food that it is able to digest and assimilate. As we study the development of the improved swine as best we may, we see that the amount of flesh produced is not the only marked improvement, but that its production is at the expense of relatively decreased amount of food. It is undoubtedly true that the quality of food has also been very much improved, but the total amount required has been decreased to a marked degree.

To briefly sum up man's endeavors in the production of these animals, which we may for convenience designate as meat producers, we may say he has succeeded admirably in producing more at a less cost. If we are to judge of the future by what has already been done, we may confidently expect that greater strides will be made in this direction. We hope and sincerely believe that the limit has not yet been reached. The great improvement that has been made with swine is comparatively recent. While hogs have been bred by man since the earliest history, improvement was not first made with swine, but with other classes of live stock. Horses, sheep and cattle were all improved before there had been much change in swine. Both sheep and cattle were greatly improved through selection and feeding, and without the introduction of the blood of alien breeds or types. Not so with swine. The great improvement came after the blood of different types was commingled. Relatively speaking, we may consider the improvement of swine as of recent date.

As man lessens the effort imposed upon the animal to seek sustenance, to that extent is he able to divert greater energies towards the formation of those parts which are most highly prized. By selection and skill in breeding, he has also relatively increased the proportion of the most desirable parts. Not only is the amount of meat produced from a given quantity of food greatly increased, but its quality or value is also greatly enhanced.

It is my thought to discuss with you, if possible, one phase of economical meat production in swine; namely, the relationship between age and growth, or age and meat production from food consumed. It has been long known that the young of domestic animals make relatively a much more rapid growth than do those animals which are further advanced in their life's history, but not until quite recent times have accurate data been determined with a sufficiently large number of animals to give us anything like a general law or principle. Since the establishment of the Federal Experiment Stations, in 1887, numerous experiments have been made, which enable us to determine in advance the average development of a considerable number of animals with a marked degree of certainty.

A few years ago, Professor Henry, Director of the Wisconsin Experiment Station, gathered together the results of American Experiment Stations which pertained to the feeding of pigs at various ages, and averaged those that were comparable and tabulated the results. From these results, which were gathered from widely differing sources and made with a large number of animals, it is shown that pigs during the first seven days after birth gain about seventy-six per cent. of their total weight. During the third week, about forty per cent. During the fifth week, about twenty-five per cent. During the seventh week, about twenty-two per cent. During the ninth week, about nineteen per cent. While the decrease in percentage gain, as the birth period is receded from, is fairly constant, yet it does not decrease in proportion to the increase in total weight, or as the age of the animal increases. That is, the percentage increase in weight is most rapid immediately after birth. This grows rapidly less for a few weeks and then more gradually less and less until a time or period is reached when there is no further gain. From experiments made with hundreds of older animals, the percentage increase in weight has been quite accurately determined for average good conditions under which swine are usually kept.

Pigs weighing thirty-eight and one-half pounds a piece showed an increase of sixteen per cent. in one week; those weighing seventy-eight pounds, an increase of seven per cent.; of one hundred and twenty-eight pounds, six per cent.; of two hundred and seventy-one pounds, three and eight-tenths per cent.; of three hundred and twenty pounds, three and one-tenth per cent. These tests were made by a number of Experiment Stations and with hundreds of animals. Some of the averages were determined from more than a hundred trials or experiments. This data, taken as it is from so many trials made in different parts of the country, should give us a safe means of estimating what we may expect from approved modern treatment and good average conditions. While the older animals do not make

nearly so great a percentage increase as do the very young ones, yet their gain is so much greater than that of animals approaching maturity that the economical pig feeder cannot afford to ignore the question of age when he is selecting stock for his feeding pens. When we compare the amount of food required to produce a pound of gain in live weight at the different ages, we find the comparison almost as striking. With pigs weighing thirty-eight pounds a piece, about three pounds of feed were required to produce one pound of increase in live weight. At seventy-eight pounds of weight, four pounds of feed were required to produce one pound of live weight. At three hundred and twenty pounds of weight, a little over five and one-third pounds of feed were required to produce a pound of increase. Here again it is shown that older animals do not turn the food which they consume to so good an account as do the younger ones. While it is true that as the pigs grew older they consumed much less food per hundred pounds of live weight, yet they did not make so good use of it, from the farmer's standpoint, as did the younger animals. The young animals, not only consumed a much larger proportion of food than did the older ones, but they seemed to be able to digest and assimilate it or to turn to good account a larger percentage of that which they consumed. But one says that young animals digest their food closer than do older ones. We do not know this to be true. While we recognize that very young animals are given food that is more easily digested, yet it is not known that they have greater powers of digestion than is possessed by older animals of the same breed.

I may say that the weights of the food during the earlier stages of the pig's existence are not given because they are not readily determined accurately, as the food normally consists largely of the mother's milk which, as to quantity, is difficult to estimate. As no method having as yet been discovered for drawing the milk from the dam equal to a litter of young pigs, experimenters have preferred to confine their work to later periods of life when the food could be accurately determined, both as to quantity and to quality.

While young animals produce a much greater gain in live weight for the food consumed than do older ones, and consequently produce a relatively cheaper market product, yet it is perhaps well for us to remember that as a food product the meat of the young animal and that of the older one should not be compared wholly by weight. While the deliciousness of the young meat may be the greater and, in many instances, this may be a most important factor, yet we should not forget that it also has the greater water content. The food value and market price are not synonymous terms by any means. Without doubt the greater percentage gain in total live weight of

the young animals is due, in part at least, to the fact that this gain is more largely of proteids, which necessarily means a great increase in the total amount of water.

If young meat or pig pork is produced by the consumption of less food, then the greatest profit lies in the production of such meat, provided the initial cost of the pigs at birth or at weaning time be left out of the question. The practical swine raiser, however, is forced to reckon the initial cost as well as the cost of food which the animals consume at later periods.

During the past two decades, or, perhaps, quarter of a century, we have heard much concerning early maturity, which is a most potent factor in the production of pig pork. Hastening the maturity of the animals which were reared for early slaughter has received much attention, and marked gains have been made, particularly with the small, compact, refined breeds. Formerly heavy pork was in greater demand than at the present time. With the increased demand for pig pork, breeders have successfully endeavored to hasten maturity and secure a greater and more mature growth at an early age.

In the past, comparatively little systematic attention has been bestowed upon the various breeds, with an idea of increasing the fecundity or prolificacy, that the initial cost of the animals which are fed for the production of pig pork may be lessened. It seems to me that here is an important field for improvement that has received comparatively little attention from those who are putting forth an honest effort to produce something better. It is generally conceded that the efforts to hasten maturity have had the effect of decreasing fecundity. While we do not know of any law that shows or tends to show that these two—early maturity and fecundity—are incompatible, yet one has been developed, undoubtedly, at the expense of the other. One has received marked attention; the other has not. The latter has undoubtedly been neglected and much to the detriment of the economical production of young animals for the market. When the swine breeders of the country devote their energies to the improvement of swine for the production of pig pork which shall include both early maturity and fecundity, without doubt a most marked change will be made. When we consider that the great effort made in this country was to produce a lard animal, and that these efforts were eminently successful, for in no other country has fat swine reached so high a degree of perfection, may we not confidently expect similar great changes when the breeders bend their united efforts in another direction? Taking into account the fact that the great improvement of swine has been made in comparatively recent times, it not only seems reasonable that further im-

provement may be made, but that man may direct the improvement or changes along chosen lines if he only gives his best thought and efforts to that end.

The CHAIRMAN: We are now ready to hear the report of the Committee on Resolutions; Mr. Lighty, the Chairman of the Committee will present the report.

RESOLUTIONS.

MR. LIGHTY, Chairman of Committee on Resolutions: Mr. Chairman, your Committee on Resolutions submit the following:

Whereas, The citizens of West Chester and Chester county received and welcomed, with many generous acts of open-hearted kindness, this meeting of the State Board of Agriculture and Farmers' Normal Institute, and contributed very much to its success, therefore, be it

Resolved, That we consider ourselves under many obligations to them, and especially to their Chief Burgess, Charles H. Pennypacker, and to Dr. G. M. Phillips, of the West Chester State Normal School; and be it further resolved, that we tender our sincere thanks to the Brandywine and Foxcroft Granges for the excellent music, to Aaron J. Kift and son, Edward Harvey, Morris Palmer, and Isaac Passmore for the floral decorations; to the Traction Company for courtesies extended; to Messrs. Kates and Detrich, who made it possible by their generous liberality and thoughtful consideration for this body to examine the great work under way at the Harvest Home Farm; to the local Chairman, Mr. Norris G. Temple and Dr. M. E. Conard for the excellent arrangements for the comfort and entertainment of all those who attended, and for their untiring efforts which contributed much towards making this meeting a success, we extend our hearty thanks.

Your Committee note with pleasure that the ladies not only favored us with their presence at this Normal Institute, but earnestly and efficiently contributed to the real work of instruction for which they deserve the highest commendation. May this phase of the work be rapidly extended.

Among the prominent co-workers in the cause who favored us with their presence and gave instructive talks at our meeting, we desire to mention Hon. Franklin Dye, Secretary of Agriculture of New Jersey, and Hon. W. L. Amoss, Institute Director of Maryland, and Mr. Alva Agee, of Ohio. To the Hon. John Hamilton, Institute Specialist for the United States, and other representatives of the National Department of Agriculture, and the representatives of our

State College and Experiment Station, we desire to express our obligation.

To the press, local as well as general, we acknowledge our indebtedness.

Realizing the importance of centralized schools and township high schools to our rural population, we would earnestly urge more liberal appropriations of State funds to extend the same, and we would urge that the benefit of such appropriations be extended to such township high schools as are associated with boroughs of less than one thousand population, provided, a course of agricultural instruction is given in such schools.

And, whereas, all this educational effort was originated and made possible by the untiring zeal and energy of our Institute Director, A. L. Martin, be it

Resolved, That we acknowledge a debt of gratitude and extend a vote of thanks to him.

And further, we urge a more liberal financial support to the farmers' institute work of our State.

W. H. BROSIUS,
D. A. KNUPPENBURG,
L. W. Lighty,
Committee.

MR. DRAKE: I would like to add that this body instruct Director Martin to send our sympathy to the wife of Dr. I. A. Thayer who has been one of our most faithful workers in the past.

MR. CLARK: I move the adoption of the resolution.

The motion being seconded, it was agreed to, and the resolutions were declared adopted.

MR. MARTIN, Director of Institutes: Friends we shall carry away with us the remembrance of generous hospitality extended to us by the good people of West Chester and Chester county, and these scenes, we shall recall them in days and years to come. Our occupation differs from that of all others known to man, in that it started at the beginning of the human race and has been carried on through the ages down to the present day. It is the one occupation most essential, upon which all others are dependent. To bring to our minds the importance of the application of the highest order of development and intelligence to the operations upon the farm, the farmers' institutes have been inaugurated, the great schools upon wheels, which travel up and down the valleys and over the mountains of Pennsylvania to stimulate the farmer and equip him for this great occupation of agriculture.

Institute managers and lectures, I wish to thank you for the kind

support you have given me and the expressions of confidence in the resolution just passed which is of more value to me than all the gold and silver in the mines of the world. The confidence of my fellow-men is of more value than all earthly treasures combined.

Thanking you for the generosity, kindness and forbearance that you have extended to me in the many years of the past, and speaking for you a safe journey home, I will say no more at this time.

The CHAIRMAN: I always look with pleasure to these State meetings and the pleasure has always been with me to have a warm shake of the hand of the chairmen and of the lecturers. It is always sad that in our meetings when it comes to the parting of the ways, and when the final hand-shake is taken that we must separate perhaps not all of us ever to meet again. I feel that I have learned, and I am satisfied that you have all learned something here, and I would say, let us carry that home with us and let us spread it out among our people. Sometimes you know people get a swelled head, and that is a disease that is incurable. There is no doctor who can give you medicine for a swelled head. I do not believe there are any swelled heads among the farmers' institute managers or among any of the lecturers, but I want to say, let us follow our leader; we have one here who I believe has his whole heart and soul with the agricultural people, and my hope is that he may be spared yet many years to carry on this work and to bring new ideas before our agricultural people, and I say, let us follow him.

On motion, the Institute adjourned.

A. L. MARTIN,

Deputy Secretary and Director of Institutes.